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Management of small towns water supply, Ghana

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ABSTRACT

Delivering improved water services in small towns in low-income countries encompasses particular challenges. Often considered too large to be effectively 'community managed', small towns may also be too small, with too limited economies, to benefit from utility style professionalism and economies of scale. The most recent paradigm, that financially sustainable water services will be best achieved through the 'Demand Responsive Approach', has been complemented in Ghana, the focus of this study, through the development of a variety of management models, community, local government, national utility and private providers, to deliver DRA.

Taking advantage of this unusual situation, in having a wide range of different functioning models in one country at the same time, this research has sought to investigate these management models with respect to effectiveness, equity, financial sustainability and efficiency of services delivery. However, the context in which all of these models operate relates to consumers' effective demand, key to delivering a demand responsive approach. A second objective, necessary to validate any results relating to management models, has therefore been to investigate households' actual demand for improved and alternative sources of water.

Data for the research was gathered from examples of the four management models in use in Ghana, from eight small towns spread across the length and breadth of the country. The methodology incorporated key-informant interviews, user observations, household surveys and an analysis of relevant documents of operators and policy makers. The fieldwork was undertaken in two separate periods, designed to ensure that any effects of dry and wet season variations, which influence water supply delivery as well as demand, were adequately captured.

The research found that none of the management models in use in small towns in Ghana could be considered to be significantly more effective than any other; overall, households demonstrated a limited demand for water supply with even this demand distributed among a number of sources, both formal, improved and alternative, traditional sources; this demand was not so much a function of affordability, rather a clear choice as to where to use limited resources – mobile phone access absorbing three times the amount spent on water. Whilst certain management characteristics were found to make a difference, leadership in particular, no one model was able to influence the overarching water source effect, that is the cost of formal supply (surface water costing approximately three times more than ground water), relative to access to alternative, 'free' supplies in the context of limited overall demand for water.

Keywords
Small towns, Ghana, management models, sustainable water supply.

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Thank you all very much.

DEDICATION

I dedicate this thesis to the entire Braimah family of Timupe, Kpembe both Dead and Alive

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List of abbreviations

ADB	Asian Development Bank
AVRL	Aqua Vitens Rand Limited
BNWP	Bank-Netherlands Water Partnership
BOT	Build Operate Transfer
CCODP	Canadian Catholic Organisation for Development and Peace
CIDA	Canadian International Development Agency
CWSA	Community Water and Sanitation Agency
DA	District Assembly
DANIDA	Danish International Development Agency
DGIS	Netherlands Directorate-General for International Cooperation
DISCAP	Districts Capacity Building Project
DWST	District Water Sanitation Team
GNA	Ghana News Agency
GoG	Government of Ghana
GTZ	Gesellschaft Für Technische Zusammenarbeit
GWCL	Ghana Water Company Limited
GWSC	Ghana Water and Sewerage Corporation
IBNET	International Benchmarking Network

ISODEC	Integrated Social Development Centre
IWA	International Water Association
JICA	Japan International Cooperation Agency
KfW	Kreditanstalt für Wiederaufbaudsf
MDG	Millennium Development Goal
MWRMD	Ministry of Water Resources Management and Development
MWRWH	Ministry of Water Resources Works and Housing
NCWP	National Community Water and Sanitation Programme
NDPC	National Development Planning Commission
NEPAD	New Partnership for African Development
NGO	Non Governmental Organisation
PPIAF	Public-Private Infrastructure Advisory Facility
PRO	Public Relation Officer
PURC	Public Utilities Regulatory Commission
PWD	Public Works Department
SIDA	Swedish International Development Agency
UNDP	United Nations Development Programme
UN-HABITAT	United Nations Human Settlements Programme
USAID	United States of America International Development Agency
WELL	Water and Environmental Health at London and Loughborough
WSDB	Water and Sanitation Development Board

CHAPTER ONE

1 Introduction and research objectives

The provision of adequate water supply services to the growing population of the world continues to challenge sector professionals, governments, donors and all other stakeholders. It is widely acknowledged that as at the year 2000, 1.1 billion people worldwide were without access to safe water supplies and it is targeted that by the year 2015 this figure should be halved (Winpenny, 2003). However, the resources needed to meet this challenge are limited and in some cases are entirely unavailable due to other equally important demands.

At the International Conference on Water and the Environment, held in Dublin in 1992, it was agreed, as part of a new consensus, that water should be considered as an economic good. This developed into the apparently radical Demand Responsive Approach (DRA), to be adopted by rural (which included small towns by its definition) water supply services delivery (Black, 1998). This approach has been adapted to small towns water supply water supply provision with the view that such an approach will be effective in ensuring long term sustainability of systems provided.

A variety of stakeholders in Ghana have subsequently developed a range of management models for services delivery in small towns, public and private, community and local government, with the assumption that they could deliver sustainable, demand responsive services to consumers, some models ‘better’ than others.

1.1 The study area – the country Ghana

Ghana, a former British Colony, attained ‘political independence’ in 1957 and has had a series of military interventions in the governance of the country since 1966. These military regimes were 1966 – 1969, 1972 – 1978, 1978 – 1979 and 1981 – 1992 but since 1993 Ghana has been governed by a constitution with a multiparty democracy. The country is divided into 230 parliamentary constituencies and in addition to this formal system of governance, the traditional chieftaincy system is still a recognised institution under the constitution. These two systems of authorities have sometimes resulted into conflict especially in terms of local development programmes.

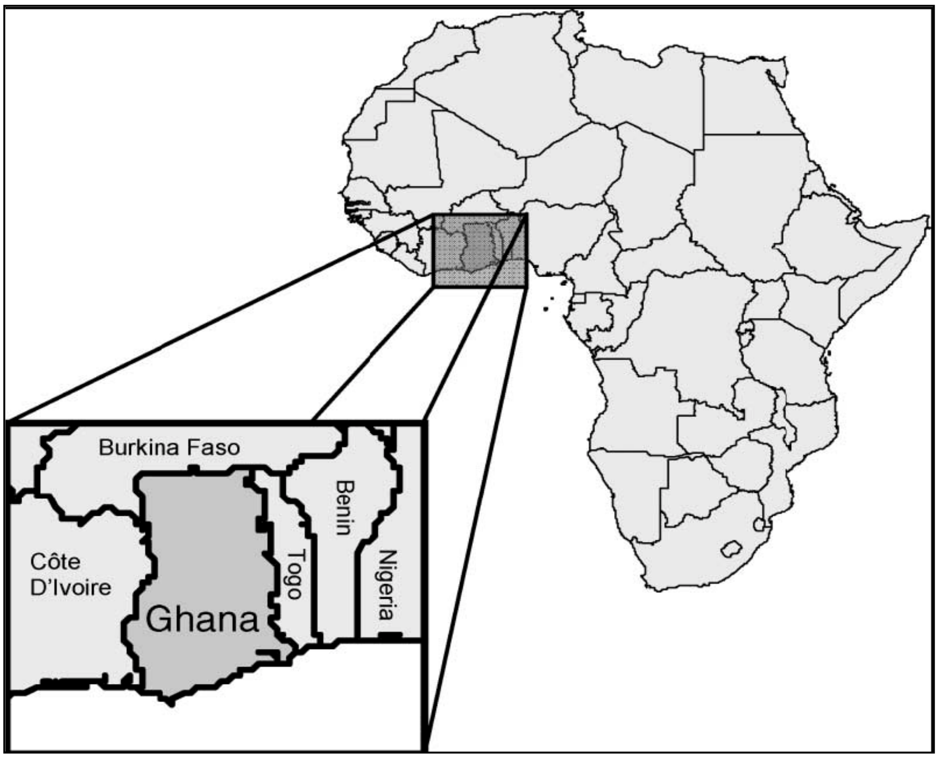

Figure 1.1 Map of Africa showing Ghana and its immediate neighbouring countries
Source: (Fuest and Haffner, 2007): pp171

The economy of Ghana is being driven by the agricultural sector, employing about 55% of the population while industry employs 18.7%, sales and clerical, 15.2% and services, 7.7% according to the 2000 population census data.

Table 1.1 Economic indicators

Year	2000	2001	2002	2003	2004	2005	2006	2007	2008
GDP (USx10^9$)	4.98	5.31	6.16	7.63	8.88	10.73	12.73	15.03	16.12
GDP/Capita (US$)	270.48	281.31	318.24	384.09	435.81	513.49	594.19	684.16	715.59
Average annual Inflation (%)	25.15	32.91	14.82	26.68	12.63	15.11	10.15	10.73	16.52
Deficit (% of GDP)	-8.42	-5.33	-0.52	0.60	-4.00	-8.12	-9.71	-11.72	-18.18

Source: International Monetary Fund, World Economic Outlook Database, April 2009

Ghana is diverse in terms of language, religion and cultural practices and these differences are manifest in the many towns and cities of the country. Any development programme implemented at the local level must acknowledge this reality at the planning stages if the desired outcomes are to be achieved.

1.1.1 The decentralised local government system in Ghana

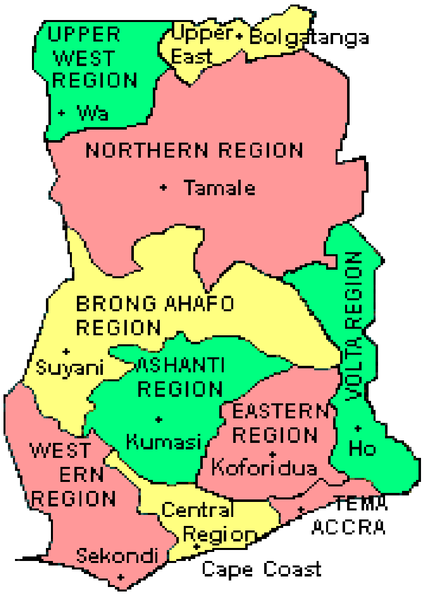

Figure 1.2 Map of Ghana showing the ten regional administrative boundaries

Source: http://www.ghanadistricts.com/home/?_=42 (Accessed 15th November, 2009)

Under the decentralised local government system, a result of ongoing government's commitment to appropriate development, Ghana is divided into 10 administrative regions with a Regional Coordinating Council in each of the 10 regional capitals, as shown in Figure 1.2. Each region is further divided into District Assemblies which include in some regions Metropolitan and Municipal Assemblies. Each of the Metropolitan Assemblies is further divided into substructures: Sub-Metro, Town Councils, Area Councils and Unit Committees while the Municipal Assemblies are further divided into Zonal Councils and Unit Committees. The District Assemblies are divided into Urban Councils, Town Councils, Area Councils and Unit Committees as shown in Figure 1.3. The lowest substructure of all the assemblies is the unit committees who are supposed to be in constant touch with the grassroots in matters of development and well-being. In terms of population, an Urban Council is supposed to contain a minimum of 15,000 people, Town and Area Councils, between 5,000 and 15,000 people, Zonal Councils, a minimum of 3,000 and a Unit committee has between 500 – 1,500 people (Aboagye et al., 2006). Both *Urban and Town Councils* are made up of single individual towns and by definition are ***'small towns'*** while the Area and Zonal councils are made up of number communities.

The local government system, which was introduced into Ghana in 1988, decentralises decision-making to the District Assemblies and was retrospectively legitimised by the 1992 republican constitution. Article 240(1) of the 1992 constitution provides for a system of local government and administration which should be decentralised. The decentralisation policy, backed by the Local Government Act 462 (1993), seeks to devolve central administrative authority and implementation of developments to the grassroots through the district assemblies (GoG, 1993).The functions devolved to these District Assemblies include the provision of water supply services and through the decentralisation of local government individual communities are expected to lead and initiate their development based on their needs. They are also expected to pay part of the capital cost whilst receiving support from the district staff (World Bank, 1994). Overall, as many as 86 responsibilities were decentralised from a total of 22 central government departments to the District Assemblies in Ghana according to Olowu (2001). There are specific functions of the District Assemblies, contained in the Local Government Act, 1993 (Act 462), relevant to the development of water supply delivery in Ghana. The District Assembly, according to Article 241(3) of the constitution, is the highest political authority in the District with "deliberative, legislative and executive powers" (GoG, 1992). The Local Government Act 1993 (Act 462) Section 15(1), also, gives the District Assemblies the power to delegate some of their functions to any of their lower structures or any other body or person the assembly determines (GoG, 1993). However, the delegated functions of the District Assemblies "do not include the power to legislate, levy rates or borrow money" (GoG, 1993). The capacity of the District Assemblies to play all the roles assigned them by the PNDC Law 207 is said to be limited due to lack of adequate numbers of skilled staff and the success or otherwise of the NCWSP is also said to depend on the performance of the District Assemblies (Fuest, 2006).

Figure 1.3 below shows the decentralised Local Government Structure on the left hand side (in bold) with the institutional arrangement in small towns water supply in Ghana on the right hand side.

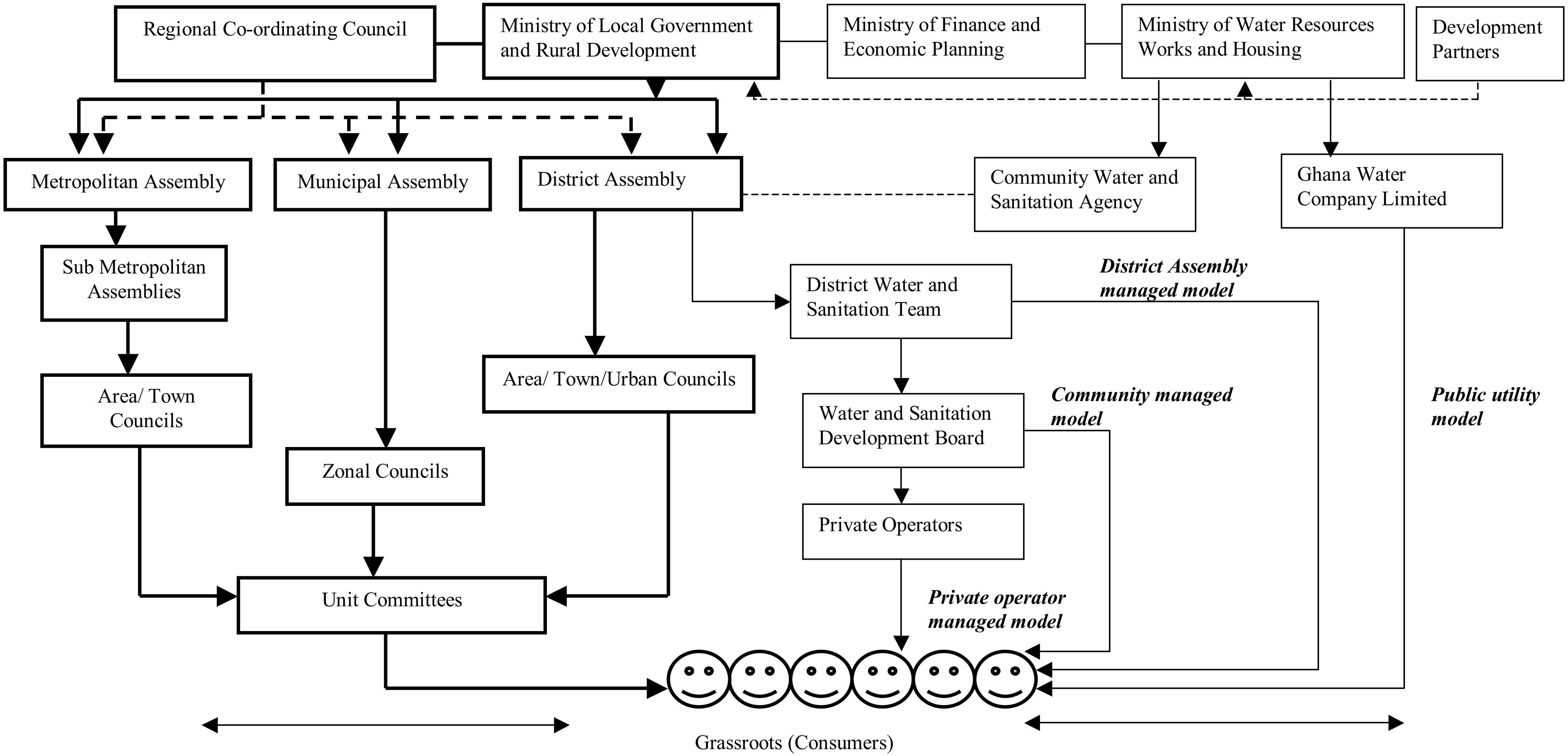

Figure 1.3 Decentralised Local Government Structure in Ghana and Institutional relationship in small towns water supply in Ghana

Source: Authors creation from Aboagye et al. (2006) and CWSA (2004a)

1.1.2 Availability of water resources

Located in West Africa, the republic of Ghana covers an area of 238,537 km^2 drained by three major surface water resources: the Volta (70%), the Western (22%) and the Coastal (8%) river systems. Average annual rainfall amounts vary from 2,000 mm/year in the south-west, through 950 mm/year in the north to 800 mm/year in the south east, resulting in total annual runoff of 56.4 billion m^3 with the Volta River contributing 74% of the total runoff. The total annual water resources availability from all the surface water sources in Ghana is 39.4 billion m^3. The country is also endowed with groundwater resources. The depth of the basement complex and the Volta basin which underlies about 54% of the country, ranges between 10m to 60m in depth and its aquifer provides a local yield of approximately 6m^3/hour. The limestone formation of the Volta basin which provides, on average, yields of about 180m^3/hour, is the deepest aquifer with depths ranging between 120m and 300m. The aquifer depths in the Mesozoic and Cenozoic formations which form the rest of the 46% of the country are between 6m and 120m yielding on average about 184m^3/hour (MWRWH, 2006). The availability of the groundwater resources notwithstanding, at the coast water developments are challenged by saline intrusion into the shallow aquifers. Insufficient yields and "dry boreholes" have also challenged the groundwater development in the Northern Region, Upper East, Upper West and some parts of the Brong Ahafo Regions (MWRWH, 2006).

1.2 Water supply services in Ghana

In Ghana, public water supply started officially in 1928 with the establishment of the Hydraulic Division of the Public Works Department (PWD) with the mandate for urban water supplies and in 1948 the Rural Water Department was established. In 1958 the Water Supply Division was formed, as a merger of the Hydraulic Division and Rural Water Department and in 1965, by Government of Ghana Act 310, the Water Supply Division was transformed into a corporation, the Ghana Water and Sewerage Corporation (GWSC) (World Bank, 1994; MWRWH, 2006; Nyarko, 2007). Before 1958 small towns were responsible for managing their own water systems (World Bank, 1994). The institutional changes witnessed between 1928 and 1965 were designed to make the water operator more responsive to the unserved by giving them the responsibility for increasing water supply coverage in Ghana. GWSC was responsible for rural and urban water supplies throughout Ghana until 1994 when it was recognised that the operator could not adequately manage water supply services for the whole country (World Bank, 1994). The review of the International Water Decade (1981 – 1990) at country level resulted in Ghana taking yet another reform, by launching the National Community Water and Sanitation Programme (NCWSP) in 1994. The responsibility for the implementation of the NWSCP was given to the rural water division of GWSC which was subsequently transformed into the semi-autonomous Community Water and Sanitation Division (CWSD) which was later transformed into the autonomous Community Water and Sanitation Agency (CWSA) by Act 564 in 1998. As one of the strategies under the NCWSP, responsibility for rural and small towns water supply was transferred to the District Assemblies to be ‘community managed’ under the decentralised local government system, whilst urban water supply became the sole responsibility of GWSC (MWRWH, 2006). In line with the decentralised local government system in Ghana discussed earlier, District Assemblies were presumed to be more autonomous, more responsive to local needs and technically and financially capable of providing local services, including water supply (World Bank, 1994). In decoupling rural and small towns water supply from urban water supply, GWSC was allowed to focus on the presumably more sustainable urban water systems, where utilities-based management could be effective, while rural and small towns were ‘community managed’. The planned community management of rural and small towns water supply was ostensibly to ensure that rural areas and small towns took advantage of the benefits that are believed to come with community ownership and management of schemes in ensuring sustainable water supply service delivery. It is however yet to be ascertained if community management of small towns water supply has brought about the needed benefits anticipated at the inception of the NCWSP. In providing water supply services in small towns in line with NCWSP tariffs were introduced at both house connection and standpipe levels (World Bank, 1994). At house connection level tariffs were supposed to be charged based on metered consumption while at the standpipes payment is made as you fetch and is usually measured by the 18litre bucket. It should however not be lost that historical arrangements, where consumers in rural and small towns did not pay for water until 1986, and with the GWSC receiving up to 50% subsidy on their operations, still pose a challenge to society's perception of water supply costs and responsibilities whilst attempts are made to improve services in the country.

1.2.1 Reforms in the water supply sector in Ghana

GWSC, which was originally responsible for water supply delivery for the entire country, apparently lacked the capacity to deliver adequate services and therefore was not able to expand to meet the growing population (Fuest and Haffner, 2007). The need for reforms in the sector in Ghana became inevitable, especially so when Ghana had become involved in the1990s development processes that subsequently became the Millennium Development Declaration (Hulme, 2009), the United Nation's development agenda towards world's poverty reduction, with particular Goals for water supply ('the MDG's).

The water sector in Ghana has not only been characterised by the described changes in policies and management. It has also been heavily influenced by the, often varying, ideas of the numerous international donor agencies operating in the sector in the country (UNDP, 2006; Nyarko, 2004). These agencies include the bilaterals: CIDA (Canada), KfW & Gesellschaft Für Technische Zusammenarbeit (GTZ) (Germany), JICA (Japan), Caise Francaise de Developpment (CfD - France), DANIDA (Denmark), DGIS (Netherlands), DFID (UK), the multilaterals: UNDP, UNICEF, World Bank, African Development Bank as well as numerous NGOs, the most prominent being World Vision (USA) and Water Aid (UK).

The current water policy in Ghana is designed to achieve the favourable health outcomes and economic growth that are required to sustained poverty reduction (NDPC, 2005) and has been prepared within the framework of MDGs and the NEPAD led African Water Vision 2025 (MWRWH, 2006). The current National Water Policy in Ghana, which forms the basis for the water sector reforms, is therefore influenced far more by external forces rather than developing out of internal understanding and targets that the country itself believes need to achieve.

The major reform in the small towns water supply sector in Ghana was facilitated by the implementation of the National Community Water and Sanitation Programme discussed later in section 1.2.2. The NCWSP began in the early1990s and was part of ongoing, externally influenced, reforms in the water supply sector. These reforms were necessary due to the inability of the GWSC to provide adequate water supply services to the entire country as shown in Table 1.2 below.

Table 1.2 Water supply coverage in Ghana

Sources of water	*Ghana*	*Urban*	*Rural and small towns*
Pipe-borne	41.6	80.3	18.8
Well	33.9	10.8	47.2
Natural sources	24.6	8.8	33.9

Source: Ghana Living Standard Survey (1998) as cited in GSS (2008)

As continuation of the reforms of the Economic Recovery and Structural Adjustment Programmes started in 1986 and the decentralised local government system which followed in 1988, GWSC in the 1990s transferred a total of 120 small towns water systems to the District Assemblies (Manu, 2001).

The reforms in the water sector which have assigned the responsibility of rural and small towns water supplies to the District Assemblies, with the CWSA playing the role of a facilitator, has not only recorded successes but also brought about some institutional challenges in the sector. Nyarko (2004) identifies the institutional linkages and accountability mechanisms between the Ministry of Local Government and Rural Development and the District Assemblies on one hand, and the CWSA and the MWRWH on the other, as 'weak'. During the celebration of one of the annual water supply and sanitation days in Ghana, 'slack supervision by the District Assemblies and CWSA and absence of bye-laws' were among a list of issues cited as posing great risks to the gains of the community water and sanitation scheme (GNA, 2006). This state of affairs is partly ascribed to the fact that the District Assemblies, whose responsibility it is to deliver water supply services to the small towns and make laws, operate under the Ministry of Local Government and Rural Development (see Figure 1.3). Whilst the facilitating Community Water and Sanitation Agency operates under the jurisdiction of the Ministry of Water Resources Works and Housing with no legal relationship with the District Assemblies (see Figure 1.3). The CWSA therefore cannot enforce any decision on the District Assembly, even when the latter is flouting the rules, especially when it comes to the WSDB whose source of power is the District Assembly. Despite the structure of WSDB's finding some legitimacy in section 15 (1) of the Local Government Act 462 (1993) (GoG, 1993), their existence is yet to be gazetted (Personal communication) posing another challenge. A contextual issue is whether a better institutional arrangement would have been the delegation of the function of water supply delivery to Town Councils as they are institutions created by the constitution of the Republic of Ghana (GoG, 1992) whose membership is by election but this has not been investigated by this research.

1.2.2 National Community Water and Sanitation Programme

The National Community Water and Sanitation Programme, launched in 1994 in Ghana, was designed to adopt the demand responsive approach to water supply delivery, aiming to:

- "Provide basic water services to communities that will contribute towards the capital cost and pay the normal operations, maintenance and repair costs of their facilities
- Ensure sustainability of these facilities through community ownership management including active involvement of women, private sector provision of goods and services, and public sector promotion and support
- Maximise health benefits by integrating water, sanitation and hygiene education interventions" (World Bank, 1994:pp20).

In line with the requirement of a demand responsive approach, that is 'demand driven' by the interests of consumers - the strategy for the implementation of the NCWP - resources are channelled to individual districts and communities based on their apparent demand for improved services (see Chapter Seven for further discussion). As a precondition for participating in the NCWSP, districts were required to establish District Water and Sanitation Teams (DWST). The composition of the DWST is drawn from three departments, Public Works, Community Development and Environmental Health (CWSA, 2004b; CWSA, 2004a). However in addition to the water supply function in the entire district, these members are responsible for their departmental duties and are transferred out of the district by their Regional and National offices without any consideration of the additional roles and training received in water supply. This has been a major challenge to effectively executing the responsibilities assigned by the NCWSP, illustrated in Table 1.3.

Demand, in terms of the NCWSP requirement, starts with the District Assembly which, in addition to establishing the DWST, must have selected some community based organisations to help in the mobilisation and sensitisation of beneficiary communities. The beneficiary communities' expression of demand is demonstrated or 'proven' through sending applications to the District Assembly with their commitment of their willingness to pay some of the investment costs, in addition to paying all of the operating expenses and the promise to manage their water supply facilities effectively.

The DWST are expected to facilitate the establishment of Water and Sanitation Development Boards (WSDB) where small towns water systems are to be provided. The specific roles and responsibilities of the key actors and institutions under the NCWP are captured in Table 1.3 below.

Table 1.3 Roles and responsibilities of actors the NCWSP in Ghana

Actors	Responsibility
Ministry of Water Resources Works and Housing	• To set and revise Water and Sanitation Sector Policies upon recommendation made by the CWSA
CWSA 1. Head office	• To recommend policies to the Ministry of Water Resources Works and Housing and set strategies, procedures and standards for small towns water supply • To source funds both nationally and international for small towns water supply • To provide back-up support to Regional Offices for monitoring and evaluation • To disseminate sector policies to all stakeholders • To let and manage contracts at the national level to consultants and contractors
2. Regional Offices	• To provide professional back up service to District Assembly staff • To monitor the progress of the Project Cycle for small towns water • To enhance sector capacity building through provision of training opportunities to stakeholders at local, regional and national levels • To monitor the effectiveness of CWSA policies and guidelines and to initiate review where necessary • To let and manage contracts at the regional level to consultants and contractors
District Assembly	• To receive and vet applications from communities, pre select and prioritise them for projects and when funds become available • To monitor operation and maintenance of systems in terms of the technical, financial and administrative performances • To periodically audit WSDB accounts (at least quarterly) • To review and approve community tariffs in accordance with tariff setting guidelines • To actively support DWST to provide technical support to WSDBs • To let and manage contracts at the district level to consultants and contractors
DWST	• To provide technical approval for WSDB plans (extensions etc) • Monitor technical and financial status of community managed water systems
Towns	• To prepare and execute plans for provision of improved water supply facilities • To mobilise funds to pay their share of the capital cost contribution and take up all operations and maintenance costs

WSDB	• To set tariff in consultation with community • To set application procedures, connection and reconnection fees • To build the requisite capacity to ensure sustainability of facilities provided • To maintain financial records for operation and maintenance and provide records to District Assembly and CWSA for inspection • To audit financial records internally • To present reports on management of water supply system twice yearly to the entire town
Private Sector	• Consultancy (design and construction supervision, hydro geological, training, mobilisation and hygiene promotion, institutional support, etc.) • Construction • Supply of equipment, spare parts, etc • Operation and maintenance of water supply infrastructure including electrical/mechanical equipment • Management of water supply schemes

Source: (CWSA, 2004a)

1.2.3 Small towns water supply in Ghana

The focus of this study are the 'small towns' which in Ghana are defined as communities with population of between 2,000 and 50,000 (Manu, 2001; CWSA, 2004a; Nyarko et al., 2006).

The low coverage of water supply services to the population in small towns in Ghana can be attributed partly to the growing numbers of small towns, and their ever increasing population, in combination with the limited resources available for investments. For example, in 1970 there were 114 small towns, increasing to 174 in 1984 and reaching 336 by the year 2000 (Owusu, 2005; Owusu, 2008). The population of Ghanaians living in these small towns also increased from 30.1% in 1975 to 47.1% in 2004. It is projected that by 2015 this small town population will increase to 55.1% of the country (UNDP, 2006). The proportion of the Ghanaian population living in these small towns is a significant target group for improved water and therefore has the potential of impacting on Ghana's efforts to meet the MDG target in water supply, now a constitutional requirement. To serve this population, estimates (WaterAid, 2005) are that US$85 million is required annually by the government of Ghana of which, to date, only US$17 million is secured. One reason for the inadequate funding of the water sector is said to be because of the lack of high political support received by other competing sectors in Ghana in the context of limited national resources (Fuest, 2006).
This investment shortfall is another reason why the provision of water supply facilities in small towns in Ghana is required to be 'demand driven'. The demand

responsive approach requires that in addition to beneficiary towns contributing 5% of the capital cost, as a commitment of their willingness to own a water system, they must raise funds from water sales for recurrent operations, maintenance, minor repairs and capital maintenance (World Bank, 1994; Fuest, 2006; Nyarko, 2007; Manu, 2001; Fuest, 2005). A contribution of between 5% - 10% of capital cost by beneficiary towns is said to ensure sustainability of the systems provided (World Bank, 1994) but this has been challenged by (Fuest, 2006). Braimah and Franceys (2009) have challenged the claim further, especially for towns in the Northern Regions of Ghana where towns are unable (or unwilling) to raise the 5% capital cost contribution and the District Assemblies have had to step in to pay all or part of that amount. This situation is confirmed by the figures in Table 1.4. During the fieldwork (2007) for this research, the Minority Spokesperson for Water Resources Works and Housing suggested that the donor community should scrap the 5% community contribution as 'that is huge burden for the small towns'.

Table 1.4 Installed capacities of water systems and community contributions

Small towns	Installed capacity of water system as percentage of designed demand	Community contribution as a percentage of capital cost
Bimbilla	51	3.8
Dafiama	92	3.5
Gwolu	96	4.8
Lambussie	88	4.6
Salaga	64	3.8

Source: Adapted from WARDROP Engineering (2001)

In the year 2000, perhaps aware of the prevailing 'fashion' worldwide, the government of Ghana begun to explore the possibilities of private sector participation in the direct management of small towns water systems with the support of the Public-Private Infrastructure Advisory Facility and World Bank.

The study recommended six towns, Atebubu, Bekwai, Dzemini/Dambai, Kilkor, Salaga and Wassa Akropong for piloting increased private sector participation in small towns (Manu, 2001). The introduction of private operators in managing small towns water supply was yet another reform strategy hoping to ensure long term sustainability of water supply service delivery according to Manu (2001) by improving efficiency, reducing political interference and increasing accountability (Fuest and Haffner, 2007). The involvement of the private operators in the direct management of small towns systems however did not come with any changes in the institutional and governance framework to that implemented at the inception of NCWSP, except that with the private operator the WSDB is not directly responsible for operations. In 2002, two private operators were signed on to manage the operations of the Atebubu and Bekwai water systems, soon after their construction (through EU funded contractors), on five year renewable contracts. However, by the end of the Atebubu operator's five year contract in November 2007, the District Assembly decided to manage the facilities themselves and dissolved the Water and Sanitation Development Board (WSDB) a situation that had developed by the time of the second period of research in the town. In Damongo, another small town, the operation of the water supply is being managed by the District Assembly without recourse to any intermediary WSDB arrangements.

In discussing the challenges confronting small towns water supply, the District Capacity Building Project (DISCAP), a Canadian Government sponsored programme meant to build the capacities of District Assemblies in the three northern regions to deliver sustainable water supply services to communities, concluded that people in the water sector in Ghana need to re-orientate their approach because the sector is currently dominated by engineers. These engineers, according to DISCAP, apply engineering solutions to management problems. They *"systematically see problems as a broken pump, overhead tank, etc, and they always become puzzled that after building a new or rehabilitating an old system to operate at a certain design capacity, when they go back a year later, the system operates at about 10% that design capacity"* (Interview with Dr Chris Brown, DISCAP, 2007). According to the DISCAP team leader, this situation arises because the 'engineers' did not do the whole job, they only did pumps, pipes, tanks, etc and then 'walked away'. The major challenge confronting the water supply sector in Ghana is the limited emphasis given to the "software" side of water supply management and, reportedly, "the good thing is that CWSA have realised this handicap and are willing to learn". The DISCAP team leader indicated that challenges such as water rationing, extended breakdown periods, weak revenue flows, pumping water for 3-4 hours a day etc are only symptoms of a management system that is broken. Therefore to tackle these problems, all the management issues must be tackled (personal communication, 2007). This narration support the claim that until the early 1990s the solution to poorly performing utilities was to provide them with proper infrastructure therefore reducing improvements to service provision to technical solutions, neglecting the institutional and managerial solutions required (Schwartz, 2008). A better approach to management was therefore presumed to be necessary.

1.2.4 The management models adopted for water supply delivery in small towns in Ghana

The evolution of the management models in small towns water supply has resulted in the different management models shown in Table 1.5 below, at different periods in Ghana.

Table 1.5 Management models used to deliver water supply services in small towns over the years

Year	Management model(s) adopted in small towns water supply
Before 1958	• Community managed
1958 – 1993	• Public utility managed
1994 - 2001	• Community managed • Public utility managed
2002 - 2004	• Community managed • Public utility managed • Private operator managed
2005 - Date	• Community managed • Public utility managed • Private operator managed • District Assembly managed

The community and private operator managed models are currently the only management models being implemented through the NCWSP and therefore were required to follow the roles and responsibilities spelt out in Table 1.3 under the formalised demand responsive approach. However the public utility and district assembly managed models are only partially based on the demand responsive approach (requiring operating and capital maintenance cost contributions, not capital contributions) but remain relevant in this study as they provide information on more supply driven water supply services.

The current management models being adapted in small towns have different institutional and management arrangements in terms of asset ownership, financing of investments, regulatory oversight and operations as shown in Table 1.6. In setting tariffs, the community and private operator managed models are required to consult the consumers in that process and to obtain the approval of the District Assembly. The operators (WSDB and private operators) are also required to present performance reports to the District Assembly and at community meetings to be organised at times shown in Table 1.3. These two governance issues are not requirements under the public utility and District Assembly managed models.

Table 1.6 Separation of functions of accountability and autonomy of management models

Management model	Asset ownership	Financing investments	Regulatory/Supervisory oversight	Operation and management
Community	District Assembly	Donors/GoG/DA and Community	District Assembly/DWST	WSDB
Public utility	Public utility	Donors/GoG/Utility	PURC	Public utility
Private operator	District Assembly	Donors/GoG/DA and Community	District Assembly/WSDB	Private operator
District Assembly	District Assembly	Donors/GoG/DA and Community	District Assembly	District Assembly/DWST

The existence of the different management models in small towns and the fact of their evolution over these periods of time with the objective of improving service delivery in one way or the other, presents a case for their investigation to determine if indeed they hold the key to sustainable water supply delivery in small towns. It also provides the opportunity to understand how each model is operating, their strengths and weaknesses, their costs and benefits. This is an interesting situation where different management models are running in parallel in the same country. In Uganda, as a comparison, there was a total switch to the private operator model after their reforms, giving little opportunity to research the effects of alternatives.

1.3 Justification of the research

The development agenda of Ghana, including the provision of improved water supply, is driven overall by the Growth and Poverty Reduction Strategy (MWRWH, 2006; NDPC, 2005)) which is a national development strategy set to ensure that the MDG and NEPAD (New Partnership for Africans Development) developmental targets are met. There is an underlying constitutional obligation to achieve these obligations. Article 40 of the Ghanaian constitution enjoins the government of Ghana to adhere to and fulfil any agreement made to the United Nation and any International Organisation in respect of treaties and declarations. Water is considered as a cross-cutting factor in the development priorities of Ghana, especially as it is considered so important in terms of economic growth and sustained poverty reduction. Therefore exploring ways of providing sustainable water supply in small towns, whose population, as described earlier, is more than a third of the whole country's population, is in the interest of Ghana and therefore eminently justifiable in research terms.

As this research is the first of its kind in Ghana to assess issues of small towns water supplies by investigating both operators, the supply side, and consumers, the demand side, in service delivery through quantitative and qualitative data analysis, it serves to confirm, strengthen or negate some of the far reaching recommendations of two earlier studies (Nyarko, 2007; Eguavoen and Youkhana, 2008)) which were based on more limited evidence.

1.4 Research aim and objectives

The overall goal of the research is to "contribute to improvements in water supply services delivery to consumers in small towns in Ghana". As the population in small towns in Ghana form a large constituency that could derail the efforts of the country to meet the MDG targets, the need to continue to explore ways of providing water supply services cannot be over emphasised.

The main objective of this research therefore is:
To investigate the management models in use in small towns with respect to effectiveness, equity, financial sustainability and efficiency in water supply services delivery.

This investigation was to be undertaken in the context of the overall policy of the Demand Responsive approach, necessarily requiring a consideration of effective household and community demand in addition to supply side characteristics.

To achieve the research objectives, eight small towns based on four management models, and with different hydro-geographical conditions, were sampled for data collection in two different periods of fieldwork, representing the transition from dry season to rainy season and from rainy season to dry season. In order that critical analyses could be made of each management model, and to establish if there were any differences within each management model relevant to the research objective or aim, the results and analysis are presented in three different chapters to reflect the four management models being investigated. As there is only one example of the District Assembly management model its data is analysed alongside the information regarding the community managed systems since these two models are most similar, each being managed by the local community at some level.

1.5 Structure and outline of the thesis

The contents of the rest of the thesis are structured as follows:

- Chapter 2 examines the literature to provide the theoretical background to the research problem by examining development trends in sustainable water supply, performance-based management. It presents the developed sub-objectives of the research.
- Chapter 3 provide details of the research design and the methods used in gathering all relevant data from the field, incorporating the seasonal variations that characterise operators' operations and consumer consumption patterns.
- Chapter 4 provides the results and analysis of community and district assembly managed service provision.
- Chapter 5 provides the results and analysis of private operator managed service provision.
- Chapter 6 provides the results and analysis of public utility managed supply service provision.
- Chapter 7 provides results and analysis of the effective demand for water supply (and complementary infrastructural) services by households from both local service and alternative providers.
- Chapter 8 presents the overall discussion of the research findings, reflecting on both the supply side models and the demand side reality.
- Chapter 9 provides the conclusions in the context of the research problem and objectives. This chapter also draws implication of the findings to policy and practice and for further research.

CHAPTER TWO

2 Literature review

"In the 21st century, capable, reliable, and transparent institutions are the key to success"
(President Barack Obama, Accra, 11th July 2009)

2.1 Introduction

The purpose of this chapter is to build the theoretical foundation upon which the research is based by reviewing the relevant literature, identifying the research issues and any gaps in previous research in the same area.

The academic literature on small towns water supply is fairly limited. During the literature search use was made of all the major search engines such as Scopus, Google Scholar, Science Direct and Aqualine. Subscription was also made to the Manchester University's 'Mimas Zetoc Alert Service' for alerts of articles in Journals such as Water Policy, Water International, Waterlines, Water Utility Management International, Utilities Policy, Water Science and Technology – Water Supply, Water Resources Management, Journal of Water Supply: Research and Technology – AQUA and Community Development Journal. None of these sources returned any articles of specific interest to this study. Literature retrieved on small towns water supply issues were reports of the international development agencies, such as the World Bank and its subsidiary agencies (particularly WSP), IRC, GTZ and DANIDA and consultant reports. The availability of literature has been a major limitation to an effective review of the issues needed to enrich this research in the terms of providing alternative views on issues.

These limitations notwithstanding, this research used the available literature to consider the critical issues relevant to the study. These limited studies in small towns water supply services also informed the recommendation by the first International Conference on Small Towns Water Supply, held in Addis Ababa, Ethiopia in 2002, that academics and professionals should be encouraged to conduct studies at community and country level with case studies (BNWP, 2002) developed to facilitate understanding of water supply to small towns.

The chapter is structured around the following sections:
Section 2.2 is a brief review of the critical roles of small towns in development and the challenges. **Section 2.3** is a review of small towns water supply which include reforms, management models and demand for improved water supply services. **Section 2.4** reviews the concept of sustainability, how it applies to water supply and the criteria for water supply sustainability. **Section 2.5** reviews performance-based management concepts involving performance measurement and performance indicators as used in water supply. **Section 2.6** presents some additional research objectives developed from reviewing the literature. Finally **Section 2.7** presents the summary of the chapter.

2.2 Small towns

Small towns, also referred to as 'small urban centres', perhaps in practice being seen as ' large villages' in some countries, are typically defined to be communities with populations between 2,000 and 50,000 (BNWP, 2002; Robinson, 2003; UN-HABITAT, 2006) and are considered to be critical in national development agenda. There are several debates that attempt to justify the role of small towns in regional development (Owusu, 2008; Hinderink and Titus, 2002), with interests in poverty reduction (Owusu, 2008), decentralisation and local governance (Owusu, 2005; Owusu, 2004). Small towns are also described as transitional entities, deemed to lack the social cohesion of rural areas (Moriarty et al., 2002).

Small towns according to Hinderink and Titus (2002), play the vital role of providing efficient economic nodal points and as servicing centres necessary for the development of the rural hinterlands through linkages, spread and trickling down effects - hence the perceived need to strengthen and reinforce their institutional structure. There is little specifically relating to the issue of infrastructural services in this challenging economic setting of small towns, let alone any concern with regard to water supply delivery. But for these small towns to deliver such levels of economic development they might be presumed to need to deliver to their inhabitants an adequate level of services. However as Moriarty et al.(2002) indicated, one unique challenge of small towns, especially those in Africa is that they often lack effective urban institutions with their inhabitants considered to be less educated and less wealthy than conventional urban dwellers. This raises the question as to the capacity of small towns to sustain service provision on their own. It has been reported however that over the years these small towns have been overlooked although they provide the markets and services to rural enterprises which facilitates the connection of these enterprises to the metropolitan growth centres (Hinderink and Titus, 2002). The suggestion for the need to have their local economic development prospects strengthened, and both living and living conditions in them improved as additional means to attaining the MDG targets (UN-HABITAT, 2006), in itself is an indication of the challenges in providing the needed efficient nodal points as maintained by Hinderink and Titus (2002).

Rapid population growth rates recorded in small towns are considered challenges by policy makers and regional planners, particularly in ensuring adequate and continuing services delivery (Hinderink and Titus, 2002; BNWP, 2002). The rapid population growth rates in the towns have been influenced by different factors in different geographical locations worldwide (Hinderink and Titus, 2002). In Ghana for example, the Structural Adjustment Programme, decentralisation and the local government reforms, expansion of local agricultural and commercial activities combined with favourable locations either on trunk roads or closeness to mining or other larger cities, have been cited as influencing growth in small towns (Owusu, 2008). Decentralisation and the local government reforms have to a large extent also contributed to the proliferation and increase in numbers of small towns in Ghana as all the capitals of the 124 District Assemblies are small towns. As the constitution provides in Chapter nine that after every population census (every 10 years) there must be a redefinition of District boundaries (GoG, 1992), coupled with the continuous agitation for more Districts, small towns will continue to increase in Ghana as both institutional as well as economic growth centres.

The economic growth potential of small towns are considered as key to ‘controlling’ the rapid growth of metropolitan areas due to rural urban migration with the hope that the small, rural economy based ‘market’ towns will, in effect, act as ‘half-way houses’ which, by retaining some of the migrants before they reach the big cities, might mitigate the impact on the apparently unmanageable demand for housing and services in the cities (Owusu, 2008). This argument which is being advanced to justify the need for increased development in small towns ignores the challenges these transiting migrants will have on the already limited services in these small towns which are already characterised by high population growth rates of their own. Therefore small towns are not only being pressurised by the political economy and market forces of the larger urban towns, as suggested by Hinderink and Titus (2002), but also by the demands of the rapidly increasing population. The results of growth centre strategy can outrun the capacity of those centres to support that growth.

Small towns are said to be vulnerable within the political economy and market pressures of large urban centres as production of goods and services are tailored for their consumption interests. Another unique challenge of small towns worth discussing is that conventional urban centres are believed to be more attractive to professionals and specialists than the small towns (Hinderink and Titus, 2002), an indication of a challenge in respect of human capacity to manage service provisions.

In order that small towns play their critical and important role in the economy, policy makers and governments must evaluate their challenges and capacity in order to understand the environment within which services are to be provided as these challenges of the towns are likely to reflect adversely on the performance of service provision.

2.3 Small towns water supply

Recognising that challenge, in the specific case of water supply provision, larger populations are considered favourable (Nauges and Berg, 2007). A large population is suggestive of larger overall consumption of water but with significantly reduced unit costs for producing and distributing that water, an indication of the benefits of economies of scale (Nauges and Berg, 2007). The impact these issues have on water supply needs further discussion.

Rapid population growth rates make future water demand projections unreliable, affecting the long term sustainability of the systems designed (Lauria, 2004). But the ability to assess and project future water demand of small towns is vital in the sustainable management of such systems (Moriarty et al., 2002). Household demand for water supply services is discussed later in the chapter.

There is a difficult balance to achieve in the use of shorter design lives to bring demand projections closer to reality, thereby avoiding the excess cost usually transferred to customers in times of over-design of systems (Lauria, 2004) against the inefficiencies inherent in upgrading systems which are inevitably delayed. Particularly where under-design of water supply systems, in a situation of rapid population growth, will likely lead to the failure to meet the other challenge of correcting the declining coverage figures that are detrimental to meeting the MDG targets (UN-HABITAT, 2006).

In low-income countries, where investments in the water sector are usually driven by donor funding of specific water projects, the various levels of government do not have control over the funding levels (Fuest and Haffner, 2007) and by implication the type of designs. Economies of scale are achieved when increased supply of water results in reduced unit cost of producing and distributing the water. Such economies of scale are an important feature of water supply which, because of the cost of the distribution network, is considered a natural monopoly (Nauges and Berg, 2007) where putting alternative distribution networks in the same area is rarely an option. Although it is said that small towns are sufficiently large to benefit from pipe network systems, they are also considered to be too small to be efficiently managed as conventional urban water utilities (BNWP, 2002).

Piped water supply is considered to be a capital intensive activity (Nauges and Berg, 2007). Whether the resources to be accessed for the needed expansion of piped water services are to be recovered fully from consumers or from other sources has not been adequately answered by both BNWP (2002) and Sansom and Fisher (2005). However, with limited potential economies of scale posing a threat to financial sustainability there remains the critical driver of public health and poverty concerns (Black, 1998; World Bank 1994).

On coverage, of the estimated 1.1 billion people who lack access to safe water supply worldwide, most of them live in small towns of low and middle income countries (UNDP, 2006; BNWP, 2002; UN-HABITAT, 2006). About a half of these small towns without adequate water supplies are found in South Asia, Latin America and Sub-Saharan Africa (Calaguas and Cann, 2006), which of course includes Ghana.

Inadequate water supply continues to impact on the fight against poverty as most poverty reduction policies consider the provision of water supply as one of the favourable poverty reduction implementation strategies (UNDP, 2006; NDPC, 2005). Two reasons account for this thinking. First provision of improved water supply allows more time, which otherwise would have been used in search of water by households from unimproved sources, to be redirected to other economic activities that contribute to household income. Second, the use of improved water sources by households contribute to minimising incidents of water borne diseases, leaving households with healthier members to embark on economic activities that provides income to the household (NDPC, 2005; GSS, 2008).

The general water supply situation, especially regarding the low coverage in small towns, has been attributed to the many years of neglect of this sub-sector. Increased interest is largely required to make up for those years of neglect in the past water sector reforms (UN-HABITAT, 2006). The call for studies at community and country level or case studies by professionals and academics reflects the requirement for tools to be developed to enhance water supply service provision in small towns (BNWP, 2002).

This lack of adequate research to properly validate experiences of different approaches to the management of water supplies in small towns has been considered a major constraint to the development of the small towns water sector (Moriarty et al., 2002). The following discussions of the historical developments in the water supply sector support this position of long years of neglect of small towns water supplies.

Historically, water supplies in the main urban centres, administrative and commercial were the first to receive the attention of governments, both colonial and newly independent. The latter, in assuring their people of the better life promised when independence was achieved, extended and in some cases introduced water supply to the large cities (Crow, 2007). It should be remembered that the agitations for independence from colonial rule were staged in the cities (oral information).

This situation of water supply services to the cities and their surroundings continued until 1977 when the new era for international cooperation targeted at providing improved water supplies to the developing countries was staged at the United Nations Water Conference in Mar del Plata, Argentina. These efforts again resulted in the assumption that the solution was the provision of water supply to the cities using standard western type infrastructure, as these were the systems available for funding from donors (Black, 1998). These actions were influenced by the 1976 Human Settlement Conference which brought to fore the crisis confronting the worlds' cities, sometimes described as 'the exploding cities' (Black, 1998). This urban expansion in developing countries was said to be happening much faster than the projections based on historical developments from Europe and North America (Black, 1998), therefore demanding, and receiving, global support.

By 1980, when the International Drinking Water Supply and Sanitation Decade (1981-1990) was launched, the apparently worse water supply situation of the rural areas became the target of concern of the both donors and governments, so becoming the major focus of the first Water Decade (Black, 1998). The review of the challenges that militated against meeting the water supply target within the Water Decade in the early 1990s was the point when water supply to small towns began to gain attention. The period of review of the Water Decade coincided with the period when small towns were already gaining much attention for their role in regional and in spatial development to facilitate poverty reduction and equitable development in many developing countries (Owusu, 2008). The chronology of events shows that small towns water supply was recognised during the pursuit for improved urban water supply (UN-HABITAT, 2006) and not as a direct search for solutions to small towns specific challenges. It was in

2002 when the first international conference dedicated entirely to small towns water supply was organised in Addis Ababa by the World Bank, following earlier regional conferences in Ouagadougou in 1998 and Nouakchott in 2001 (BNWP, 2002).

The challenges of providing improved water to the populations in small towns are multi-faceted and not limited to those posed by population growth rates. In addition to the challenges of the water supply sector in general, small towns are confronted with the challenges specific to them some of which have been discussed earlier. These specific challenges have been detailed in literature (BNWP, 2002; Sansom and Fisher, 2005; Vezina, 2005) and this research, it is anticipated will unravel new ones and confirm others already identified.

The conventional water supply sector is particularly 'capital intensive' for such a low cost product, therefore tending not attract private investment and requiring the intervention of governments for the financing of capital investments, thereby making them prone to political interference. The apparently poor performances of public water utilities resulting from political interference has been much discussed and debated in the literature (Robinson, 2003; Baietti et al., 2006; Nickson and Franceys, 2003; Fragano et al., 2001; McGregor, 2008). This interference is described as manifesting itself in over-recruitment of staff for the utilities and failure to charge cost reflective tariffs as politicians usually want tariffs kept low, irrespective of the costs involved in the operations. Similarly, general reforms in the water sector have faced political interference, especially reform suggestions that might take away political control over water services, are mostly resisted by politicians (Kingdom et al., 2005).

Despite the negative interference water supply services may have suffered from politicians, there are good points to note of the interaction between politics and water supply services. The laws governing the roles and responsibilities of both the water institutions and all stakeholders are made by politicians. These laws ultimately ensure proper and effective water supply governance by providing voices to the different segment of stakeholders and particularly consumers through their roles and responsibilities (UN-HABITAT, 2006). This power of the politician, when harnessed properly by adopting the appropriate strategies, should go a long way to enhance improved water supply.

In managing small towns water supply services provision, there are different institutional arrangements found in literature (WSP, 2005; Robinson, 2003; Fragano et al., 2001). These include the existence of a national authority to, manage, regulate or to provide the overall policy framework and a local government to take up the responsibility to ensure accountability from service providers. In Uganda the Ministry of Water, Lands and Environment is the national authority with the Town Councils being delegated by the Local Authorities to supervise the private operators who deliver water supply services to the consumers (Watasa, 2007; Tumusiime and Njiru, 2004; Wood, 2000; Price and Franceys, 2003). Irrespective of institutional arrangements, successful management of small towns water supply is believed to lie in the 'ability to plan and manage adaptively' where small towns are characterised by dynamism, rapidly changing customer bases and demand (Moriarty et al., 2002).

In order to overcome the challenges in delivering water supply services to the small towns, governments have had to introduce reforms in the water supply sector. But it is claimed that the reforms that are desired by the politicians are those that have been estimated to produce higher political benefit as against the political cost (Saleth and Dinar, 1999) and not necessarily those that ensure sustainable and effective water supplies.

2.3.1 Reforms in the small towns water sector

Governments, especially those of lower-income countries, have undertaken reforms in their water supply sector in an attempt to improve water supply services to their populations. The reforms, especially those of the 1990s, were badly needed as millions of people were without access to piped water and for millions of others, the services were of poor quality and these were as a result of deteriorating infrastructure, fast population growth, poorly managed utilities, low tariffs and large investment needs (Marin, 2009b). This is the description of conventional urban water systems which had received attention early in the process of water supply development and which are said to have the economies of scale needed for sustainable water supply delivery. The challenges of the water sector that calls for reforms to improve have been listed to include, limited services coverage, low efficiency and accountability of service providers, and poor reliability and affordability of service delivery (Kirkpatrick et al., 2004; Locussol et al., 2009).

The reforms, designed to arrest the situation described, proposed the introduction of 'sound policies' and effective institutions which were presumed to be better able to generate cash flows, close revenue gaps, and attract financial resources (Ginneke et al., 2004). A significant aspect of the reforms involved private sector participation, initially at least presupposing private sector investment to limit the political interference described earlier. In some cases the reforms in the water supply sector generally came about as products of some general reforms in a country, either political, governance or economic reforms (Fragano et al., 2001; Rivera, 1996), not specifically related to water. This is the case in Ghana where the decentralised system of water supply service delivery in rural and small towns (World Bank, 1994) was to conform to the ongoing reforms in decentralised system of local government started in 1988 (Owusu, 2005; Olowu, 2001).

In any case, these general reforms, especially those taking place in lower-income countries, although meant to be responding to the challenges confronting large urban water systems (UN-HABITAT, 2006) have brought to the fore issues of small towns water supply which over the years have been neglected. These reforms which are led all too often by the World Bank and other international development agencies (Marin, 2009b; Kirkpatrick et al., 2004) are based on basically the same principles in all the different countries they operate (UN-HABITAT, 2006), ignoring the economic and political differences that exist in those countries. And as long as low-income countries depend on these donors for their water sector funding (Franceys, 2008) they might have to be content with the decisions of the international development agencies in the mean time. But as there cannot be one solution to solving the challenges of public utilities everywhere (Calaguas and Cann, 2006), reforms need to be country specific and to tackle specific challenges or short comings. Therefore any studies directed at understanding how water supply services are delivered to small towns in specific cases, particularly relating to the role of the private sector relative to government involvement, are going in the right direction (Heyns, 2005).

Global small towns case studies

The Local Government Act (1997), the National Water Policy (1999) and the Water Statute (1995) provided the bases for the institutional and legal framework for the implementation of the reforms (Watasa, 2007; Tumusiime and Njiru, 2004) of 1997 in Uganda. The reforms were directed at increasing coverage of water supply services to the over 24 million population after a number of unsuccessful attempts. The reforms in the supply of water to small towns in Uganda ensured a separation of asset ownership of water systems and capital investments from their operation and management and commercialised service delivery for long-term sustainability (Watasa, 2007).

The adoption of a new constitution in 1991 and the Public Services law (142/1994) provided the basis for decentralisation and private sector participation in water supply and sanitation services in Colombia. It also provided for a redefinition of responsibilities between the central, provincial, and municipal authorities with the central government responsible for setting policies, regulating, and overseeing the water sector, while municipalities are responsible for provision of services and securing investment capital (Fragano et al., 2001). Allowing local government authorities to source funding for water supply infrastructure within their jurisdiction is an option in the right direction. However providing that option in the policy document and implementing it in reality are two different cases. For instance Article 241 of the Ghanaian constitution provide that District Assemblies can source their own funding for their development projects (GoG, 1992) which include water supply services but no literature has yet been cited showing any district assembly having any funding on their own for development projects. Two and half years of operation of a domestic private operator contracted in line with the reforms to manage six small towns in addition to Marinilla Municipality in Colombia, on the average services improved. Coverage increased by 15%, unaccounted for water reduced from 46% to 41% and expected to reduced further to 35% the coming year, metering increased from 84% to 100% and continuity of service improved from 83% to 100%. The operator received an

International Certificate of quality award for its efforts to maintain high quality performance (Fragano et al., 2001). Based on these indicators provided it can be said that reforms that led to the involvement of the private operator improved the technical performance but as this report was silent on the financial performance, the overall performance of the private operator cannot be judged at this point. These improvements were also not compared to any standard that might have been set for the operator and therefore the judgement of the effectiveness of the operations could not be determined.

In countries where several reforms have taken place, the extent sometimes reflects the type of government in place at the time. After gaining independence from the United States of America (USA) in 1946 the water sector in Philippines went through several reforms with the responsibility to manage the water systems going back and forward between the central government and the local government. Reforms in the water sector occurred between 1955 and 1971, in 1973, 1980, 1991 and in 1997 (Robinson, 2003).

The reforms in these years in the water sector were fashioned to fit into the political arrangement of the time, an indication of another case of dependence of small towns water supply on politics. In the Philippines, the well rooted community-based management models are the most successful because they are the type of institutions that prosper in the highly politicised environment as politicians are aware of the communities awareness of what is required of them in service delivery. The strong community involvement in such management models ensured the autonomy, transparency and accountability in the service delivery (Robinson, 2003) as politicians risk losing power when poor services are delivered.

The impact of public participation in ensuring transparency in water supply delivery has extensively been espoused in the literature (Rouse, 2007). However in countries such as Ghana where the illiteracy rate is high (more than 40%) (GSS, 2005), and citizens do not understand or appreciate their roles in the decentralised systems, community involvement and participation may just be reduced to discussion of issues by the few elite in the community.

The dependence of the water sector of developing countries on development partners for support for their water sector (Franceys, 2008), both financial and technical, has resulted in the donors having influence on the policies and reforms of small towns water supply (Watasa, 2007; CCODP, 2005).

For example, in Kenya the Swedish International Development Agency has influenced the subsidiary legislation of the Kenyan Water Act (MWRDM et al., 2004). In the Philippines the use of different management models to provide water supply services were preconditions for donor support to successive governments (WSP, 2005). The influence the donor partners have on the water sector reforms in general, and small towns supply in particular, has been a major challenge, especially when the support from the donor comes to an end in the cases of projects. It is therefore important that the water sector donor community direct their efforts into building the capacity of sector players in lower-income countries, to enable the development of policies that suits the state of the countries they operate in (UN-HABITAT, 2006; Heyns, 2005). Failures of reforms in the water sector have also been blamed on the donor partners who have been accused of mostly providing consultants to write up policies which turn out to be vague in implementation (Fuest, 2006). Lack of professional expertise in developing countries could also be responsible for this state of affairs. In executing a project funded by the World Bank to assess the performance of small towns water systems in Ghana, CWSA contracted a staff member of the World Bank to undertake the study rather than a Ghanaian consultant (Pilgrim, 2002).

2.3.2 Management models in small towns water supply

The literature describes how reforms in small towns water supply have been implemented through a variety of different management models, with both centralised and decentralised approaches adapted to deliver services. These models, which are discussed further in this section, will ideally have been applied depending upon each country's understanding of the models, the political, legal and institutional frameworks in those countries, though the literature suggests otherwise. In delivering water supply services to small towns the management models adopted have tended to be either direct management by local authorities, management by the beneficiary communities or delegated management to a professional operator (BNWP, 2002). Management by communities and delegated private operators take one of many forms discussed later in the chapter. Irrespective of the management model adopted for water supply delivery, some key management and institutional principles are believed to be required in order to achieve targets or objectives (Flynn, 1997). And to achieve these targets or objectives managers need to ensure effective configuration of resources and processes in a way that ensures reliable service delivery (Johnston and Clark, 2005).

Consumers of water supply services expect from their service providers affordable and dependable service delivery at all times and this can only be achieved when the key management issues contribute to each other in order to overcome challenges confronting the management model (Cole, 2004). A characterisation of the key management issues that need to be considered in a typical business organisation is shown in Figure 2.1.

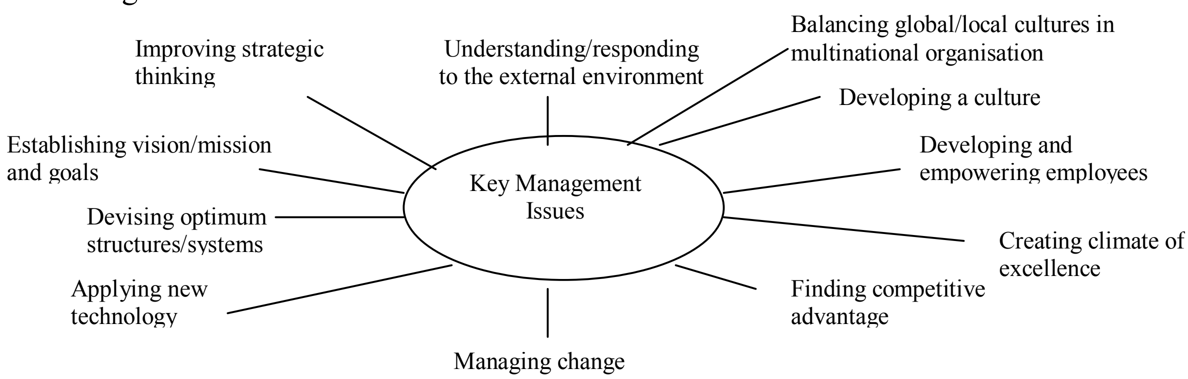

Figure 2.1 Key management issues
Source: (Cole, 2004)

Similarly in small towns the key management issues captured in Figure 2.1 are considered as “ingredients of success” (BNWP, 2002) and need to be provided at all times irrespective of the management model being used. These in no particular order of importance are, financial and managerial autonomy, transparency and accountability mechanisms, adequate professional support, competition, legal and regulatory framework, responding appropriately to consumer demand and provision of incentives for expansion (BNWP, 2002). Whilst in Figure 2.1 all the key management issues are controlled or executed by the business entity some of the ingredients of success shown in Figure 2.2 are controlled or executed by bodies external to the water system. Of the seven issues in Figure 2.2 only two: responding to demand and transparency and accountability can be said to be under the control of the operators or managers. In small towns where operators' revenues are unable to cover full supply cost (Braimah and Franceys, 2009), financial support is required in addition to the professional support indicated above if sustainable service delivery is required. Financial and managerial autonomy, competition, incentives for expansion are all supposed to be contained in the legal and institutional framework and regulation and professional support provided by external agencies. These issues, as tools of management, need to work together, complementing each other as well as impacting directly on the successful management of small towns water supply. Therefore any water system without these adequate external supports which in this context include the legal and institutional framework might not be able to deliver the right levels of water supply services.

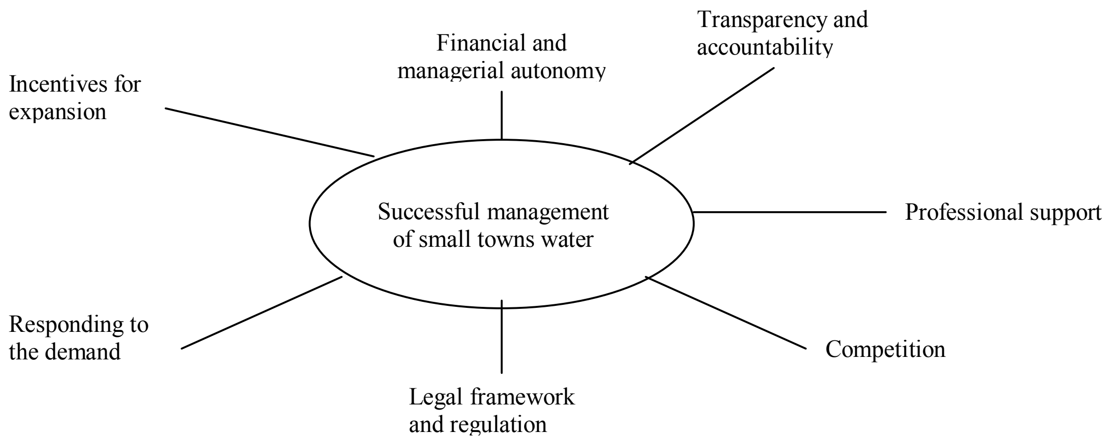

Figure 2.2 The ingredients for successful management in small towns water supply
Source: Adapted from (BNWP, 2002)

As to which institutions provide or perform what functions towards the successful management of the water supply delivery services must be defined and enforceable to ensure accountability. Management of small towns water supply as mentioned already can either be through direct or delegated management and no matter the management type, issues such as asset ownership, responsibility for asset oversight, regulation and that of service provision (operation) within the institutional and legal framework must be clarified (Ginneke et al., 2004). In the traditional system of centralised service delivery, all these responsibilities are bundled into one organisation, but as the reforms seek to increase accountability and autonomy, these functions reportedly need to be separated and handled by separate institutions (Baietti et al., 2006; Ginneke et al., 2004).

Typical relationships between the institutions responsible for the separated functions in urban water supply, which is relevant to small towns especially in cases where water supply functions are delegated, are shown in Figure 2.3. In some countries like Ghana, small towns water supply are not regulated but are to be monitored by the District Assemblies and the CWSA. However in many of the small towns in Latin America they are regulated in both economic and quality terms (Fragano et al., 2001; WSRC, 2009).

That regulation is however not without some challenges especially from the municipalities who consider national regulation of the water supply services as continued control over their management services which have reputedly been decentralised to them (Fragano et al., 2001).

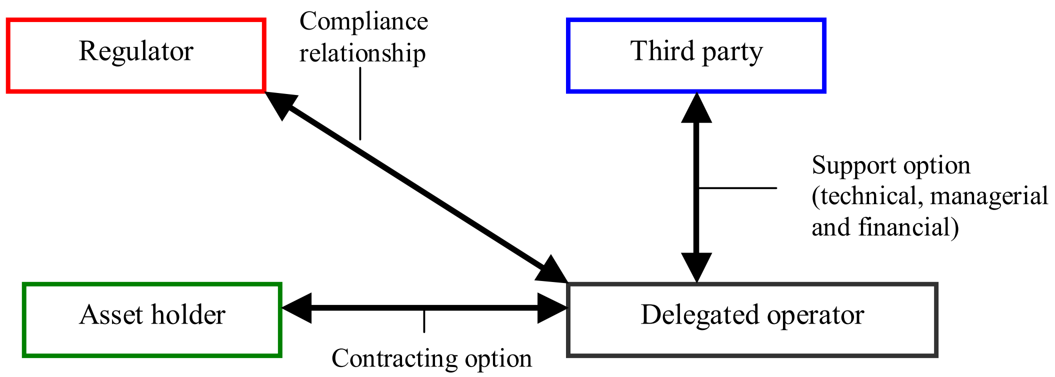

Figure 2.3 Separation of functions to ensure accountability and autonomy under a regulated environment

Source: Adapted from (Ginneke et al., 2004)

The development of water supply in general has been hindered by the limited numbers of professionals, even in the urban cities of developing countries (Ginneke et al, 2004) where availability of better infrastructure is said to attract professionals. It is therefore a challenge to small towns to attract the appropriate level of human resources in the water supply sector and a need for systematic support may be required to fill in the gap. As indicated in Figure 2.3 the support from the third party which is external to the operator or management model (in the case of this research) could assume different forms (technical, managerial or financial). Earlier research findings suggest that for small towns water supply systems to be managed sustainably they must be given the necessary financial means (Moriarty et al., 2002), that is they cannot be self-financing.

A key aspect of small towns water supply management is decentralisation of powers, responsibilities and authority, to local bodies in line with the demand responsive approach to service delivery (Black, 1998; World Bank, 1994). Deconcentration, devolution and delegation, which are all considered as different forms of decentralisation, differ from each other in different respects and are diagrammatically represented in Figure 2.4 below.

Deconcentration is considered as the relocation of a centralised decision-making body closer to the location of activities by opening regional or branch offices of the central government ministries or agencies (Fragano et al., 2001; Brown et al., 2001; Prud'homme, 1995).

Devolution is said to take place when the powers of a centralised system or central government is transferred to first-order subdivisions or local governments (Fragano et al., 2001; Brown et al., 2001; Adamson, 2006).

Delegation on the other hand is defined as the transfer of specific decision-making or responsibility for specified functions to subordinate agencies or other public organisations outside normal central government control, whether provisional or local government or parastatal agencies (Fragano et al., 2001; Prud'homme, 1995; Israel and Rosenweig, 2000).

Decentralisation in itself involves greater transfer of powers from the centralised system to a lower structure with the responsibility of regulating itself without any organised authority above it. When a system is fully decentralised, there is no other authority in control and all the units within the system work together and alongside to deliver the desired services (Kim, 2008). Decentralisation in water supply is intended to improve service delivery, to strengthen local governments, and to improve health outcomes and the environment (Fragano et al., 2001; Israel and Rosenweig, 2000). However, decentralisation is also said to increase corruption or, at the least, increase the potential for corruption (Prud'homme, 1995). It has been indicated also that in most cases responsibility for decision making is always passed on lower level units without the financial or regulatory means of implementation (Moriarty et al., 2002).

Decentralisation is believed to bridge the gap between service providers and customers as the decentralised units are better able to provide services that best reflect consumer preferences by utilising the better access to local information of consumers (Kim, 2008). Decentralisation could also contribute to the reduction of bureaucracies and ensuring responsiveness and accountability from public services providers (Brown et al., 2001; Kim, 2008).

The case studies conducted in three small towns, San Julián in El Salvador, Itagua in Paraguay and Marinilla in Colombia, showed examples of water supply delivery that was delegated to respectively a municipal water company, a community water board and a private operator (Fragano et al., 2001). The factors of the successes of these three delegated entities were slightly different from each other though. Operational and financial autonomy, strong political will to allow the system succeed and popular community support which was a result of proper participatory and transparent consultation at project inception, were key to the success of the municipal water company of Julián. On its part, community participation, introduction of professional management of the water system by the professional manager employed, autonomy and the availability of other professionals in the town and their willingness to serve on the board had been the key factors for the success of the Itagua water system. The private operator in Marinilla was successful because of community participation of the people, including the elite group, the municipal administration being well informed of their social obligations and their commitment to ensure proper service delivery and the commitment of the operator to its objectives (Fragano et al., 2001).

The three case studies have shown that although the same model of decentralisation was adopted, the issues that lead to their successes varied slightly. It could also be speculated that if all three operators had adopted the same set of processes they might not have achieved the same levels of success. It appears that the processes or approaches to service provision that a management model or operator adopts can be more relevant than the management model itself. In the case of the community managed system in Itagua, employing a professional manager to take charge of the operations of the water system, supported by a board made up of professionals, had a noticeable effect (Flynn, 1997).

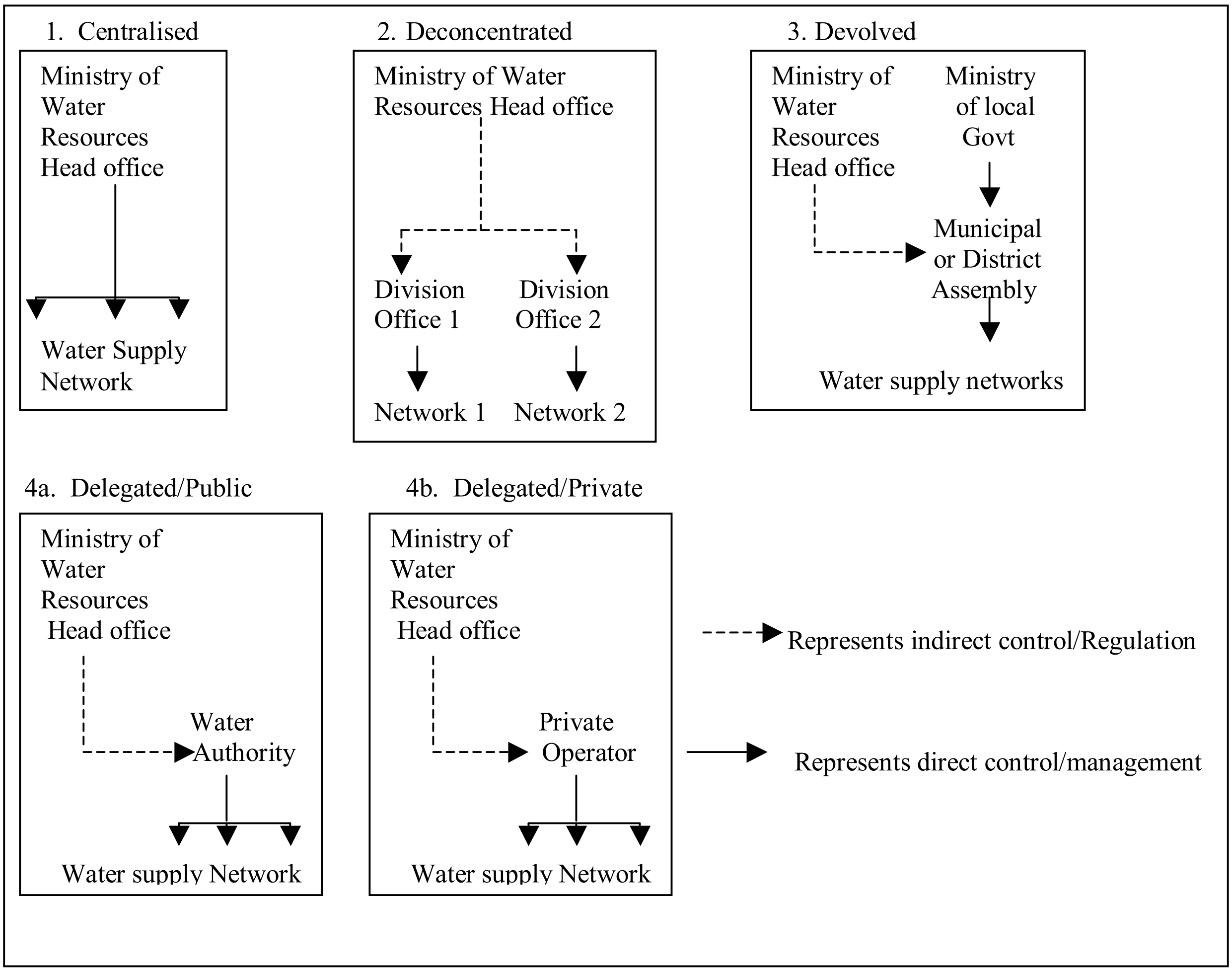

Figure 2.4 Centralised and decentralised management of water supply services

Source: Adapted from (Franceys, 2006)

The level and type of decentralisation adopted in water supply service delivery are not the same worldwide. In Uganda, where private operators are delegated by the Town Councils through a Water Board to deliver water supply services, the source of authority of the Town Councils are the District Councils, who operate on the devolved powers from the central government (Watasa, 2007; Tumusiime and Njiru, 2004; Price and Franceys, 2003). This Uganda example, and the water supply services provision within the decentralised local government structure in Ghana, provides evidence that in water supply provision it is possible to implement different levels of decentralisation in the process.

As many lower-income countries are turning to decentralised models of management to address inefficiencies in public sector service provision, including water delivery, the challenges which could reduce any potential benefits of decentralisation must be catered for from the implementation stage (Kim, 2008). Prud'homme (1995) in his article on “Dangers of Decentralisation” provided evidence to suggest that when decentralisation is not properly implemented the results could increase disparity, jeopardise economic stability and undermine efficiency (including increased corruption) at national, regional and local levels.

The literature indicates that the most common management models being adopted in small towns for water supply services are community management, contracted private operators, public utility and the local government (authority). Depending on the socio-political arrangements in some countries, these management models are further classified, increasing the number management models. In the Philippines six different management models are identifiable: Local Government Unit, Water Districts, Rural Water Supply Associations, Water Cooperatives, Private Sector and the Cluster or the hybrid model (Robinson, 2003). The Rural Water Supply Associations and Water Cooperatives are community based organisations and the Water District represents the public utility model. In Vietnam, six management models in the form of Small Town People’s Committees or Commune People’s Committee, Cooperatives, Community, Private Water Companies, State Owned Enterprises and Provincial Water Supply Companies are identifiable (Berg, 2002). In Uganda, small towns water supply delivery are largely through different local private operators who have been contracted by the Town Councils (Watasa, 2007; Tumusiime and Njiru, 2004; Price and Franceys, 2003). Additional characteristics of the management models which make them unique are further described below.

In decentralising responsibility and power to lower level units of administration with different levels of authority within and with others, negative effects of variables such as power distance on the management practices must be catered for in the institutional arrangements. Power distance is the manner in which power is distributed in an organisation (Bassett, 2004). In their research, Francesco and Chen (2000) established a relationship between power distance and management practices. According to the authors, power distance plays a moderating role on the influence of participation on organisational commitment, job satisfaction, performance, and even on the intention of staff to stay in the organisation. Employees' perception about power distance has been found to be critical in successful management of organisations. Tan and Chong (2003) concluded in their study therefore that any attempt by organisations to change perceptions of power distance in order to enhance performance should focus on changing organisational environment that seek to make employees the centre of management decisions and thereby flattening hierarchies.

Community managed water supply systems

Historically, debates regarding participation in development began as early as the mid to late 1970s but became widespread since the 1980s as the critical component in raising development levels with advantages to both the community and the support agencies (Lammerink and Bolt, 2002). Community participation in development is said to ensure better acceptances of services and eventually leading to enabling people to gain control over their lives which is true development (Lammerink and Bolt, 2002) but Fragano et al. (2001) claims that it is only possible in communities where communal ownership has been part of the community history. In communities where central governments have been responsible for service delivery, this position of Fragano, et al (2001) is therefore that community participation is likely to be less, or even in-effective, a claim this author is inclined to agree. However in the past two decades community management has become the leading model for the implementation of water supply services in the rural areas of developing countries (Lockwood, 2004). During the International Drinking Water Supply and Sanitation Decade, community participation concepts were adopted as part of efforts to meeting the "Water for All" targets and extended to include operation, maintenance and cost-sharing of water supply systems (Lockwood, 2004). This was a deviation from earlier approaches where water supply was classically structured based on public health issues (Black, 1998). Again at the Earth Summit in Rio de Janeiro in 1992, outlined in Agenda 21: a strategy for sustainable development in the 21st Century, the benefits of community management were again spelt out (Evans and Appleton, 1993) and considered to be vital in ensuring reliability, sustainability and replicability of service provision. Community management is also considered as the potential vehicle required for achieving development goals that are more efficient, sustainable, and cost effective water supply (Lammerink and Bolt, 2002).

A community managed model is often favoured in development when government institutions are observed to be performing poorly in sustainable service delivery (Bolt and Fonseca, 2001). For this reason some civil society organisations accuse governments of neglecting their responsibilities to improve services (Personal communication with ISODEC Ghana). Community management is also favoured when implementing donor and NGO sponsored projects in low-income countries as the NGOs believe that it is the way to inject the right attitudes that promote feeling of ownership of such projects (Harvey and Reed, 2006). And, by implementing their programmes through community participation, the NGOs became the voice of the communities and a parallel provider of services (Lockwood, 2004), a situation that has reportedly increased service provision in developing countries.

In order to implement the community management model in service delivery, communities are required to set up committees to facilitate local management of the schemes whilst still remaining accountable to the community at large (Bolt and Fonseca, 2001). These local management arrangements are sometimes specifically established for that singular purpose of managing the water system. Alternatively the approach utilises the existence of existing community organisation for the management of the water system (Fonseca and Bolt, 2002). Community management of water supply services utilises the benefits of community participation through a consultative process of empowerment designed to establish communities as effective decision-making bodies (Harvey and Reed, 2006). As communities urbanise, community management models in their development programmes tend to become ineffective as it becomes difficult to mobilise volunteers (Doe and Khan, 2004) and small towns have been specifically cited as lacking the social cohesion of rural communities (Moriarty et al., 2002). It has been claimed that the most suitable population bracket that ensures effective community managed development, especially in water supply, is 1,000 – 3,000 (Doe and Khan, 2004) but this author doubts if this can be true in all cases. It is important that for community management to provide sustainable services, the linkage between participation and ownership of the services must be properly understood because it is claimed that participation generates ownership and ownership ensures participation (Doe and Khan, 2004), at least in theory. But for any community organisation to have ownership it must be a legal entity. When community management bodies are legalised, it allows for the opening of bank accounts and also access to funds. They can then sign contracts and that also forms the basis for solving any conflict within the community or with other organisations (Fonseca and Bolt, 2002).

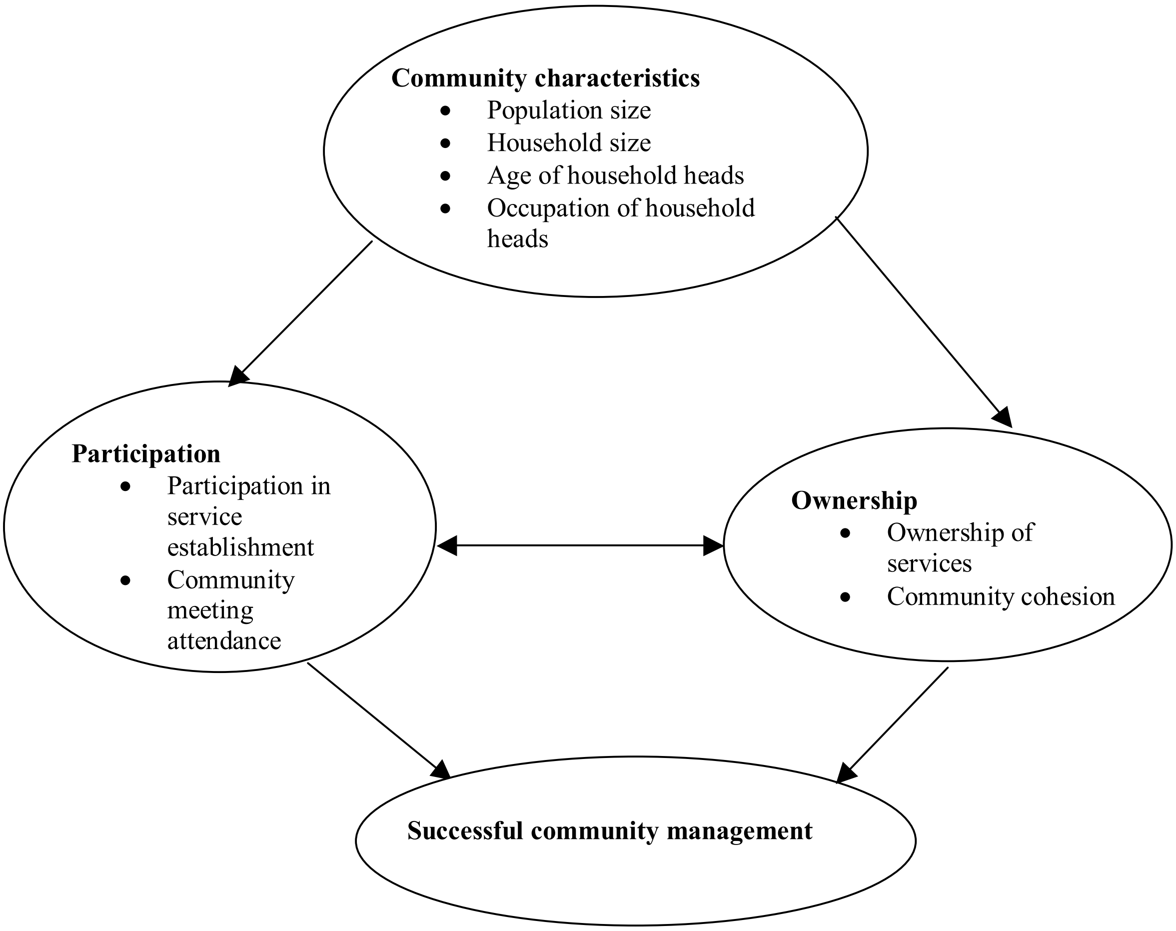

Figure 2.5 Components of successful community management model

Source: Doe and Khan (2004)

The community management models could take one of the several forms with different ownership and management arrangements (Lammerink and Bolt, 2002; Fonseca and Bolt, 2002). Community involvement in water supply delivery is not only limited to management as some authors, Franceys and Gerlach (2008) have reported how community involvement can be extended into the regulatory processes with a network of relationships to the other key actors in the regulatory environment.

Despite the enormous benefits anticipated from community management of water supply services, these can only be realised when communities have sufficient information to make decisions, they understand how to deal with the different interests and the conflicts among themselves and they have access to the necessary resources, either internally or externally to the community. In addition they must know how to delegate some management tasks and must have easy access to technical and managerial support and to spare parts for maintenance and repairs (Bolt and Fonseca, 2001).

In examining the problem of extending access to potable water, factors considered crucial to the success of community management model by Rondinelli (2006) are inter-organisational relationships, appropriate technology, effective monitoring, evaluation and feedback. These factors in the institutional and governance structure in NCWSP are external to the management model as all these functions are not performed by the operators as shown in Table 1.3 and Table 1.6. But to ensure successful management of water supply systems through community managed model a combination of issues raised by both Rondinelli (2006) and Bolt and Fonseca (2001) need to be fashioned out. In addition to the combination Evans and Appleton (1993) included strong leadership within the community as an important factor that contributes to effective community management.

Public utility management model

A ‘Public utility management model’ describes a state-owned water utility established through enactment of laws in support of their incorporation and these take one of three forms: Ministry or Department, Statutory body (or Parastatal) or Company (Baietti et al., 2006). As public utilities, government appoints the Board of Directors who in turn appoints the executive management to be in charge of day-to-day operations. The accounts of the utility are (ideally but not always in practice) operated separately from that of other state organizations (Baietti et al., 2006). This separation of responsibilities is designed to ensure adequate autonomy necessary for effective operations. However, public water utilities are often challenged by a lack of autonomy (external and internal), and lack accountability and these have affected negatively on the performance of those utilities. Indeed, the poor performance of these utilities has been attributed to the general failures that characterize state-owned enterprises in developing countries (Baietti et al., 2006; Budds and McGranahan, 2003).

Table 2.1 Characteristics of three types of public utility organisations

	Ministry or Department	**Statutory body (or Parastatal)**	**Company**
Legal foundation	Normally an executive order	Statute	A memorandum and articles of association (registered under a companies act or the like)
Status as legal entity	Normally unincorporated, thus without legal personality separate from that of the government	Either incorporated or Unincorporated	Incorporated (thus has own legal personality)
Basis for ownership	Notionally owned by the government as creator	Notionally owned by the government as creator	Owned by the government as creator and shareholder
Legal framework	Operating under public law	Operating under public law	Operating under private (company) law

Source: Based on Thyne (1994) as cited in (Baietti et al., 2006)

In assessing the provision of urban water supply in some African countries by public utilities, (Cudjoe and Okonsi, 2006) concluded that the utilities in all six countries were faced with similar challenges. These are high water losses coupled with insufficient metering, lack of competition, tariffs not set to reflect actual cost of providing water, resulting in heavy financial losses, little if any ability to fund future infrastructure, low transparency and accountability to customers and finally, rent-seeking by public officials. Some major reasons why publicly provided water supply systems are performing this badly have been attributed to the over centralisation and politicisation of operational decisions and designs of systems which have traditionally been driven by engineering criteria at the expense of long-term operations and cost implications (Lewis and Miller, 1987). When the challenges confronting public utilities (small towns included) are not adequately tackled, the vicious cycle that is possibly generated is similar to what is shown in Figure 2.6.

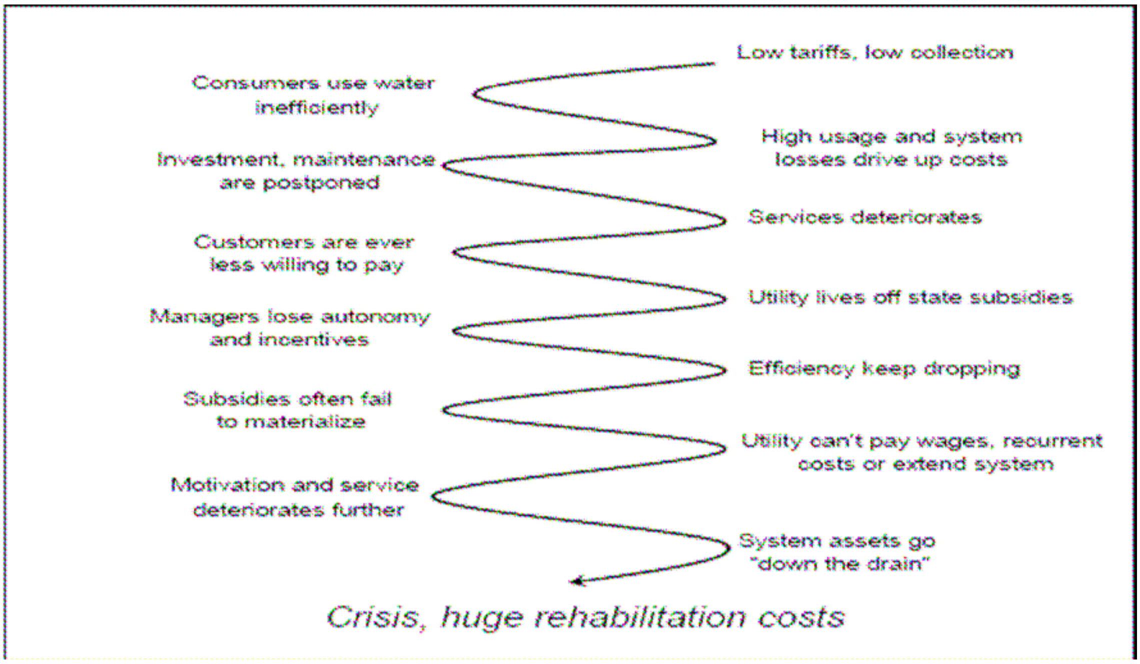

Figure 2.6 The vicious spiral decline in performance of public water utilities in developing countries
Source: WSP/PPIAF (2002) as cited by (Baietti et al., 2006)

Figure 2.6 illustrates how utilities that charge low tariffs and record low bill collection efficiencies will invariably get into such a cyclical situation. Given this general failure by public utilities to provide adequate water supply services to consumers (Nickson & Franceys, 2003), some governments resorted to the engagement of the private sector to provide water supply services to their citizens.

Private operator managed model

The main objectives for involving private operators in direct provision of water supply services were to improve services by helping poorly performing water utilities to increase their efficiencies and coverage (Budds and McGranahan, 2003; Marin, 2009a; Braadbaart, 2002). This is because the private sector was considered as being able to address the quality, reliability, and coverage problems most water supply systems in developing countries were confronted with by the end of the 1980s (Marin, 2009b). However, Iram (2006) has indicated that the privatisation programmes that were started in the 1980s were not based on any conclusive evidence that the private sector was superior in delivering better services. Private sector involvement in services delivery has been seen by some to be a neo-liberal ideology which holds the view that social functions and economic development are best undertaken as businesses, with the state playing a facilitating and regulatory role without direct engagement (Budds and McGranahan, 2003). The idea to transfer the control of the economy from the public to the private sector was therefore based on a "belief" that it will produce an efficient system (Budds and McGranahan, 2003; Iram, 2006).

The World Bank and the International Monetary Fund therefore, in seeking to reform the ailing economies of the developing countries, promoted private sector participation in service delivery, including water supply services delivery in the 1990s, based upon ideology rather than evidence according to some authors (Budds and McGranahan, 2003; Lobina and Hall, 2009). Others also hold the view that privatisation was used as the vehicle for reform and institutional development by the international community at large (Franceys and Weitz, 2003) but saw it as a practical tool for service enhancement rather than as part of any ideological struggle. The World Bank clearly believed, in the early stages of this reform initiative, that privatisation of public utilities in low-income economies would promote more efficient operations, increase investments and service coverage and reduce the financial burden on government budgets (World Bank, 1995; Ariyo and Jerome, 1999).

Supporting this approach, recent consideration of 'property rights theory' views private enterprises to be more efficient than public or state-owned bodies because, according to the theorists, because under private ownership the economic welfare of society is better maximised than under public ownership (Braadbaart, 2002). This argument is based on the premise that under private management, society's economic welfare maximisation is better aligned with those of the firm's owners than is the case under public management (Braadbaart, 2002). However, there are reports that show that privatisation of State Owned Enterprises has generally not been successful (Braadbaart, 2002; Ariyo and Jerome, 1999) due to the absence of developed capital markets, lack of the appropriate legal and judicial framework, low per capita incomes and lack of regulatory structures.

All these limitations to the success of private sector provision of services are issues that are not under the control of the service providers and are required to be provided within the wider business environment.

Due to limitations of a wholly private sector in delivering services such as water supply, 'public-private partnerships' have been suggested by many as the better alternative or perhaps compromise (Lewis and Miller, 1987). The aim of a public-private partnership was also to demonstrate that the involvement of the private sector in service delivery is never about private ownership of the public resources, such as water or publicly funded fixed assets, which has been a very contentious issue amongst the sceptics (Franceys and Gerlach, 2008). One form of public-private partnership which involves the private operator, civil society and government was found to be able to serve the poor in Metro Manila in the Philippines better (Franceys and Weitz, 2003). The involvement of the civil society in the public-private partnership is said to ensure that the "myth and misconceptions" that surround the politically sensitive tariff reforms are removed (Franceys and Gerlach, 2008) and made acceptable to such civil society organisations that protest against pricing water.

The different forms of private sector involvement in water supply delivery with the varying responsibilities are captured in Table 2.2 below.

Table 2.2 Different forms and key responsibilities for private participation

Increasing private participation →						
	Service contract	**Management contract**	**Affermage/ Lease**	**Concession**	**BOT-type**	**Divestiture**
Asset ownership	Public	Public	Public	Public	Public/private	Private
Capital Investment (financing)	Public	Public	Public	Private	Private	Private
Commercial risk	Public	Public	Shared	Private	Private	Private
Operation & maintenance	Public/private	Private	Private	Private	Private	Private
Contract duration	1-2 years	3-5 years	8-15 years	25-30 years	20-30 years	Indefinite

Source: Adapted from Kessides (2004) as cited in (Prasad, 2006) and Stottman (2000) as cited in (Budds and McGranahan, 2003)

For each of the forms of private involvement in water supply delivery to be successful, in addition to the specific market environment stated earlier, there should be a transfer of risk from the public sector to the private sector who are believed to be best placed to manage risk and in return the private operator should be offered a profit incentive (Grimsey and Lewis, 2002).

From the above discussion, the literature suggests no management form can deliver the needed level of water supply services when key challenges are not resolved and are not under the control of any management model. To expect the required level of service provision, a conducive, 'enabling', environment is required, something that is external to the service provider.

The literature indicates that for water supply services to be considered successful the operator must be delivering effective, financially sustainable and efficient services as these keys words were mentioned repeatedly throughout this review so far. The research objective of investigating the management models in use in small towns for efficiency, equity, financial sustainability and efficient service delivery therefore has to be seen within the context of small town effective demand for water supply service delivery.

2.3.3 Demand for improved water supply services

In the previous sections various institutional forms and reforms were considered, based upon the literature, to ensure that improved water supply services might be delivered to consumers. As the systems provided in these small towns were largely based on the principles of the Demand Responsive Approach, adopted after the Dublin Conference in 1992 (Black, 1998), there is a need to understand this demand. In order that the improvements being made to water supply service delivery are managed sustainably, consumers must actually want the amounts of water supplied by the improved water supply systems if their resources are to support the process. The historical approach had presumed that the basic human need for safe drinking water was the basis for service provision to be delivered as a public good, based upon the use of public resources (Black, 1998). Noting the failure of government to deliver sufficient resources to meet these needs, DRA developed as a means to harness local resources directly at a level commensurate with local demand. It is suggested that only when people attach quantifiable value to the service, which could be factored into the cost of water supply, would there be the guarantee that the service provided would be sustainable and therefore any water supply service provision should be based on the expression of "effective demand or willingness to pay" (Black, 1998: pp55).

As has been discussed already, the apparent inability to provide adequate water supply service to consumers to keep pace with population growth, ensure increased coverage and ensure sustainability of systems, are blamed on service providers. This direction of thought might be borne out of the belief that the transaction market between improved water supply providers and consumers is a natural monopoly and public water supply is considered as service of general interest (Alegre et al., 2006). Water supply is also considered vital to society's welfare in general, for public health and collective security of populations, economic activities and for environmental preservation (Alegre et al., 2006). Therefore governments especially those in lower-income countries who lead development programmes, must ensure such vital service is provided to the people. But despite the billions of dollars being spent by donors and governments in developing countries, many of the improved water systems provided in line with the newer approach of DRA (World Bank, 1994) are neither being used properly nor maintained and this calls for further understanding of households' water use and water-related behaviours (Mu et al., 1990).

Demand for water supply services is generally attributed to willingness to pay and the ability of households to pay for the water consumed (Merrett, 1997). But Mu et al. (1990) on their part consider a number of factors such as quality, reliability, distance from households, and time to collect water as those that influence households' demand for water. They also indicated that in small towns, where there are several sources of water with different characteristics, which source a household uses is a complex decision which has implications for water demand. Regarding time, WHO/UNICEF (2005) indicate that the longer it takes a household member to make a round trip to fetch water the less water is collected. As a result a round trip time of not more than 30 minutes is considered acceptable. Investigating further how households express their demand for the improved water provided relative to the available alternative sources will provide further understanding. Therefore any demand estimation in small towns water supply, that serve as input to the investment design of the improved water system, may have to thoroughly understand the extent to which alternative sources will or will not be used, otherwise low consumption efficiencies will continue to characterise those water supply systems (Kayaga et al., 2003).

The availability of alternative sources of water in towns has had a negative effect on the ability of service providers to charge cost reflective tariffs as consumers quickly turn to the traditional sources when tariffs are considered to be too high (Nauges and Bergs, 2009). Kayaga et al. (2003) therefore referred to the alternative sources of water as dampening the willingness to pay for improved water services. The resulting difficulty for small towns water supply systems to be managed sustainably should therefore be viewed from both the providers and the consumers perspective of the equation and not focussed on only the providers.

In determining the consumer demand for water supply services, Deverill et al. (2002) on their part, have suggested a range of factors which, according to them, are informed by consumer priorities and perception. These factors were further regrouped into three categories: user related, service level related and service related as shown in Figure 2.7 below.

Demand

User Related
Livelihood strategy
Security of tenure
Physical tenure
Economic security
Income
Opportunity cost of time
Education level
Gender

Service Level Related
Desirable characteristics of the facilities being offered
Perceptions of relative costs
Performance
Relationship to production
Price
Upgradability

Service Related
Perception of service and suppliers
Sense of ownership
Accountability & transparency
The form any contribution takes
How and when contributions are made

Figure 2.7 Main determinants of demand

Source: (Deverill et al., 2002)

The position of Deverill et al. (2002) as captured in Figure 2.7 in summary confirms the position of Mu et al. (1990) that household demand for water is influenced by a series of factors. However whilst Mu et al. (1990) were specific on the relation between these factors, Deverill et al. (2002) have not found these connections. As much as this author agrees with the stated factors (Deverill et al., 2002), an expansion of them that shows their interrelationships make for a better understanding of customer demand for water supply services. This is vital for understanding household water demand for the different household choices requiring different water quality from all available sources. In this case the household perception of the quality of water will influence the choice of source to meet the households' strategy of using different water source for the different household chores.

Figure 2.7 show that in assessing the demand for improved water supply services, the issues that are considered important determinants in the literature reviewed were willingness to pay, affordability of services being delivered, consumptions, ability to pay, consumer perceptions and available alternative sources of water. Therefore to understand how consumers demand for water from the operators, the above issues as they relate to consumer demand in general must be understood. Any investigation of the operators' performance must be done in the context of consumer demand. There is a need to investigate further how the availability of alternative sources of water have affected the use of the formal, improved systems and whether the low willingness to pay for water is a general consumer behaviour that affects other services in small towns.

2.4 The concept of sustainability

Development that meets the needs of the present without compromising the ability of future generations to meet their own needs is deemed to be 'sustainable development' (United Nations, 1987). This is achieved according to the Brundtland Commission's report, by effectively integrating environmental protection, social improvement and economic wellbeing into all development programmes. Conceptually, this understanding of sustainable development was divided into three constituent parts: environmental sustainability, economic sustainability and socio-political sustainability

(United Nations, 1987). The three dimensional thinking of sustainability (environment, social and economic) is sometimes expressed as interlocking issues in the form of pillars, concentric circles or overlapping circles to improve their understanding (Adams, 2006) as shown in Figure 2.8.

To different professionals from different fields of interest, the meaning of sustainability varies somewhat. Sustainability may be alternatively defined, focusing on the context within which it is expressed (Sutton, 2000). As this research is dealing with sustainable water supply services to the population, which involves the integration of environmental, economic and social issues the overlapping circles as shown in Figure 2.8 (3) is considered appropriate and Abrams (2001) supports this choice by indicating that water supply provision involves the balancing of social, economic and environmental issues to achieve continuing service provision. Figures 2.8 (1) and (2) have not been considered in the context of this research as they suggest that the three dimensions are treated individually to achieve sustainability a situation in variance with water supply provision (Abrams, 2001).

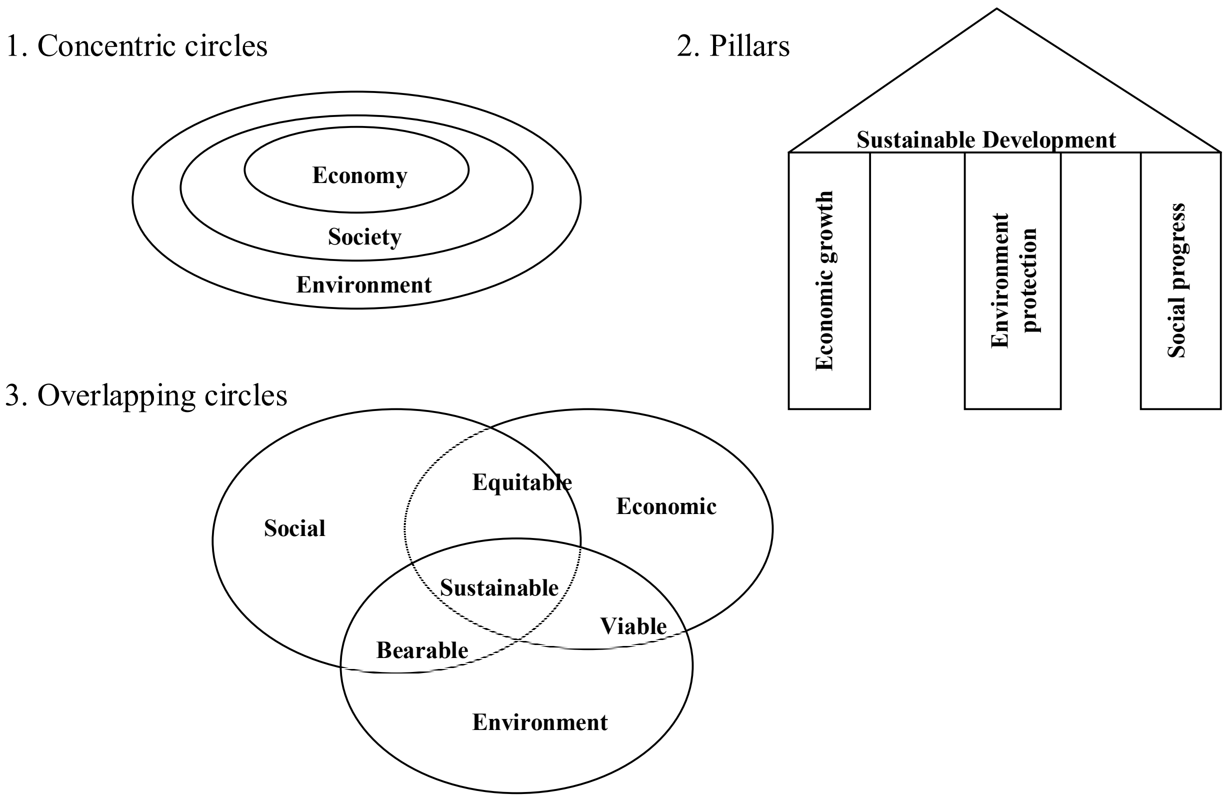

Figure 2.8 Three visual representations of sustainable development

Source: As captured in Adams (2006)

Sutton (2000) suggests that no matter the context, issues of sustainability should ensure that there is constant natural capital and sustainable income, that intra-generational and inter-generational equity concerns are taken on board, recognising the global dimension of sustainability. The other issues are dealing cautiously with risk, uncertainty and irreversibility, ensuring appropriate valuation of environmental assets, integrating environmental and economic goals in policies and activities and ensuring social equity and community participation (Sutton, 2000). Sustainability, this author believes, is a 'huge' word which needs to be trimmed to make its understanding and measurement easier.

2.4.1 Water supply sustainability

Extending the general sustainability dimensions to water supply, considered vital for the general wellbeing of the society in terms of health and poverty reduction but by the nature of its production and distribution being a natural monopoly (Alegre et al., 2006), sustainability must be made more specific and simpler. By some approaches, the availability of water supply throughout the design life of any water system in the same quantity and quality is defined as a 'sustainable supply' (Abrams, 2001) and this can only take place when **all the elements required to ensure sustainability** are in place. On their part, Fonseca and Bolt (2002) describe sustainability of water supply services simply as the system being able to deliver an appropriate and equitable level of benefits over a prolonged period of time and without negatively affecting the environment.

Abrams', as well as Fonseca and Bolt's, definitions of water supply sustainability could therefore be summarised as the provision of water of good quality, in sufficient quantity, at affordable prices to consumers. If consumers after "15 to 20 years" can turn their taps and receive a water flow and quality as good as the day the system was commissioned then the system is providing sustainable water supply (Abrams, 2001). In other words, the water supply facilities provided should continue to operate satisfactorily and generate benefits over the entire life of the project. But the provision of good quality water in sufficient quantities to consumers requires the continuous input of financial resources (Fonseca and Bolt, 2002). Sustainable water supply is said to be ensured when there is money for recurring expenses and general maintenance of the system, the service quality remains acceptable to the consumer and adequate supply is available from the source (Fonseca and Bolt, 2002; Abrams, 2001). Ensuring ongoing service requires that there should be enough funds available for capital maintenance of the system, renewal and rehabilitation for example, at the end of the useful life of components of the systems. Sustainability does not necessarily require local funding, from consumer tariffs for example, for ongoing expenses but it does require mechanisms to be in place to ensure an adequate funding stream to deliver ongoing operations and capital maintenance expenses. Ideally sustainability also includes aspects of service enhancement and extension as the consumer base develops. As weak cost recovery measures tend to lead to unmaintained services, also a vital ingredient of sustainability as presented by Fonseca and Bolt (2002), and this author supports inclusion of financial issues as a key component of sustainability. Water supply sustainability definitions should therefore encompass consumers paying for such services either directly through user fees or indirectly through other means such as taxation.

In discussing further the key issues of sustainability under the three dimensions, Abrams (2001) further categorised water supply sustainability to cover technical issues, social factors, financial elements, the natural environment, gender equity and empowerment and institutional arrangements. Availability of adequate supply from the water source raises the environmental concerns of sustainability which are as important as the social and economic concerns. Carter et al. (1999) on their part defined sustainable community water supply to involve motivation, maintenance, cost recovery and continuing support which they say are linked together where a failure of any one endangers the sustainability of the whole water supply system.

In this research the dimensions of water supply sustainability have focused on, though not exclusively, social, technical, economic, financial and institutional issues. As some of these dimensions are difficult to measure in practice, it has been suggested that in assessing sustainability the analysis should utilise a system of multidisciplinary set of sustainability indicators (Balkema et al., 2002; Makropoulos et al., 2008). In that regard, Makropoulos et al. (2008) indicate that in the assessment of sustainability, appropriate criteria derived from the sustainability dimensions should be selected and linked to the specific indicators. Explaining further, the authors indicated that sustainability criteria should be measured against the performance being assessed and that the indicators should form the means by which the levels to which sustainability criteria are satisfied are measured. It is said also that, in water supply programmes that target the poorer population especially in the lower-income countries, the goal of sustainability should link to the equally important goals of effectiveness, equity, efficiency, transparency and replicability (WELL, 1998) after Franceys (1996).

2.4.2 Goals for small towns water supply

The goals for the water supply sector (effectiveness, equity, efficiency, sustainability, transparency and replicability) mentioned in the previous section, are interlinked. They need to be packaged into sector policy, planning and design of projects with the challenges posed by the conflicting objectives of the individual criteria need to be overcome (WELL, 1998) at the initial stage of water supply systems design.

Effectiveness

All water supply services to small towns have underlying objectives to be met and the degree to which the set objectives are met is the effectiveness of water supply. Effectiveness is therefore that component which measures service coverage, quantity of water supplied to consumers and reliability of water supply services (Franceys, 2006).

Equity

Equity in the context of water supply describes the extent of service provision to all consumer segments in any town, including for example the poor and other disadvantaged groups such as women, children, old people, the sick and disabled people. As equity can affect the efficiency of water supply which may in turn affect sustainability directly, the contributions of all groups including the unserved must be considered as early as possible at the planning stage (WELL, 1998). When the implementation approaches of water supply services are more equity sensitive, services are reported to be better sustained and effectively used (Dayal et al., 2000) as cited by Fonseca and Bolt (2002). Equity in water supply service delivery is enhanced when mechanisms such as targeted or cross subsidies are adopted to make service provision affordable to the poor even where policy supports full cost recovery (WELL, 1998). Availability of water for all the user groups, as well as the existence of differentiated tariffs (and potentially services) paid per unit of water by all user groups measures the equity of the services (Franceys, 2006).

Financial sustainability

The financial sustainability of water supply services is assured when the institutional framework provides for the levels of service appropriate for the different segments of the town's population. These population segments must be willing to use and pay at the required tariff levels to generate the adequate revenues for operations, maintenance, and capital maintenance costs of the water facility (WELL, 1998). Financial sustainability may also require targeted subsidies, perhaps targeting capital costs instead of or as well as operations costs (WELL, 1998). In measuring financial sustainability of water supply service provision, average tariffs might be expected to cover full supply cost, that is revenues must cover operational costs, capital maintenance costs and the cost of capital. Alternatively defined elements of these costs may be supported through general taxation or transfers. Sustainability depends upon the appropriate mechanisms being in place, not necessarily the source of funds flows.

In discussing how prices could be used to promote equity, efficiency and sustainability of environmental resources use, (Rogers et al., 2002) considers full cost as comprising both economic cost and environmental externalities and that full economic cost consists of full supply cost, opportunity cost and some economic externalities. In this research the discussion of sustainability is limited to service delivery and hence the cost focus is on full supply cost.

Environmental sustainability

Environmental sustainability, in terms of domestic water supply requires the availability of the water source throughout the entire life of the system in the right quantity and quality to support the growing population. It has been suggested that increased climate variability which results in rainfall pattern changes in terms of timing, amounts and duration ultimately affects water quality and quantity negatively (Malley et al., 2009) and steps must be taken for their remedy if improved water supply services are to be delivered sustainably.

The catchment areas of water sources in developing countries are often said to be weakly protected, resulting in the removal of vegetative cover, human, animals and agricultural activities taking place within the catchment without prohibition (Mclntosh, 2003) causing problems of sedimentation of the sources and degradation of the water quality. The communities who are closer and live within the catchment of the water supply sources would need to be motivated to protect the catchment from any pollution and take care of the water intakes (WELL, 1998). This means that continuity of water supply to the populations in small towns could be hampered by any negative impact of the environment on the water source even, when all the other indicators are being achieved. It is therefore important that whilst attention is given to indicators that can be controlled by policy makers and service providers, the issues of the environment are also looked at closely to ensure the quantity and quality are protected.

Efficiency

The efficiency of water supply services describes the output–input relationship and may be defined as the output generated per unit of resource such as water, staff, funds, etc. It is therefore important that in lower-income countries, where professional staff and funds are limited and sometimes water resources are similarly limited, higher efficiencies than present need to be achieved in order to meet water supply coverage (WELL, 1998). Inadequate billing and high unaccounted for water have over the years reduced the investment efficiencies of high cost water projects (WELL, 1998). The indicators relevant in measuring efficiency of service delivery include bill collection efficiency, unaccounted for water as a percentage of water produced, staff productivity and the percentage of connections with functional meters.

Transparency and replicability

The literature suggests additional goals of transparency and replicability. In order to ensure transparency in water supply services delivery, a vital component of water supply sustainability, information on decisions and solutions must be made available to the public for scrutiny by all stakeholders irrespective of the management model (World Water Forum, 2009; Asis et al., 2009) to ensure accountability. The watchdog role played by civil society organisations in scrutinising the investment decisions of governments and donors and raising the alarms on possible negative impacts of those decisions have been considered to be important in promoting accountability in the water sector (Winpenny, 2003). Publications of annual reports which include financial statements, performance indicators, contract agreements, independent auditing and monitoring also ensures greater accountability (BNWP, 2002; Franceys, 2006) which is a vital ingredient in reducing acts of corruption that usually affect water utilities in developing countries (Cudjoe and Okonsi, 2006).

In order to ensure adequate coverage of water supply there is a need for successful interventions to have the potential to be rolled out to many small towns. Replicability has been considered vital in ensuring that water supply services are expanded to the unserved or to poorly served areas (WELL, 1998). Any management model which is dependent upon particular and local factors will not meet the overall goal, however successful it may be according to other criteria.

Both these additional goals are noted and will be referred to where particularly relevant but are not considered to be core indicators for this research.

2.5 Performance-Based Management

The goals discussed above relate directly to performance-based management (PBM), also called "managing for results", which is the "purposeful use of resources and information to achieve and demonstrate measureable progress towards agency and programme goals" Wholey (1999): pp288 as cited by (Julnes and Holzer, 2008).

Performance based management is one of the tools recommended to deliver enhanced levels of performance in management (Julnes and Holzer, 2008). There are two important components of performance-based management: performance measurement (discussed later in the section) and strategic planning (not relevant to this research). This research focuses on performance measurement as this is what is involved in the collection of data on service activities and outcomes and that provides the information vital for the assessment of the extent to which goals and objectives are being achieved (Julnes and Holzer, 2008).

2.5.1 Performance indicators in water supply

Performance indicators, related to the goals described, provide the tools for cross-utility and cross-country comparisons (IBNET, 2009) which are critical in injecting some competition in the sector where direct market competition is not a feasible. Performance indicators generally consist of a combination of several variables which are either measured or recorded and, ideally, will be internationally acceptable.

The use of performance indicators to measure performance, enables comparison of different utilities with different organisational arrangement and be undertaken with caution. Nickson and Franceys,(2003) contend that important indicators which influence the utilities' performance, but are not easily quantifiable, are often excluded and therefore assessments do not give the complete picture of the performance of the utility. In this regard, (Alegre et al., 2006; IBNET, 2009) have suggested that when comparing indicators from different systems there is the need to provide the contextual information which describes the inherent characteristics of the systems which are not influenced by management decisions.

In earlier assessments of the performance of small towns water supply systems in Ghana, some authors (Nyarko, 2007; Pilgrim, 2002) did not consider the contextual information while (Eguavoen and Youkhana, 2008) did not measure performance by use of any indicators. These assessments therefore did not completely describe the performance of those systems. In the said assessments, (Nyarko, 2007) relied on two performance indicators; financial and personnel data whilst (Pilgrim, 2002) used technical/operational, financial, customer and organisation/management data. Nyarko (2007) in his conclusion indicated that due to size, technology and differences in management models in small towns it is not possible to compare the efficiency indicators of small towns to that of GWCL. This posed a challenge to this research as it seeks to compare the performance of different management models in small towns which include GWCL systems, a challenge which is considered in the following chapter.

2.6 Additional research objectives developed from literature review

The insight provided by the literature review suggests that in order for this research to fulfil the main objective discussed in Chapter One: that is
to investigate the management models in use in small towns with respect to effectiveness, equity, financial sustainability and efficiency in water supply services delivery in the context of the Demand Responsive Approach.

The following sub-objectives must also be fulfilled:

- Determine the level of service provided to consumers in small towns by local operators, considering overall effectiveness and equity in access by different groups of consumers.
- Determine the financial sustainability of small towns water supply, analysing the financial performance of the formal service.
- Determine the efficiency of service delivery by the different models of formal providers.

Exploring the research objective through the literature review, it was evident that investigating the management models in small towns alone might well not provide sufficient understanding of the critical issues. The performance of the operators, through the various models, has to be adequately investigated within the context of effective consumer demand for improved water, noting the particular economic characteristics of small towns whilst also considering the easy availability of alternative sources of water. Investigating management models without considering the varying demand issues is unlikely to lead to valid conclusions.

A second objective therefore: **to investigate households' demand for improved water relative to alternative sources of water** in the context of general household expenditure, has been added which will be fulfilled by considering the following three additional sub-objectives:

- Consider what consumers demonstrate with regard to the Demand Responsive Approach by their actual level of access to, and consumption of, improved water services;
- Investigate the extent to which alternative sources of water are being used by consumers;
- Determine consumers' willingness to pay for improved water supply relative to other infrastructural services in the context of their overall household expenditure.

2.7 Chapter summary

The provision of sustainable water supply services to the increasing populations in developing countries continues to pose a challenge as a result of the poor performance of water supply service operators, resulting in the introduction of reforms in the sector. Some of these challenges expose the general weaknesses in public services delivery in developing countries.

The reforms in the water sector in general brought about changes in the institutional arrangements, roles and responsibilities of sector actors and on asset ownership, sector regulation and operations of the water supply facilities provided. Just like other public services sectors, the water supply services sector in developing countries often lacks the qualified professionals to take charge of the complex processes involved in water supply delivery, especially in the small towns. As an example, performance measurement, which is a management tool used to ensure accountability in any service sector and also used by managers to improve their performance, can only be relevant in the water sector when there are qualified staff to utilised and understand the processes involved.

The research objective set out in Chapter One needs to be sub-divided into sub-objectives with measurable indicators. Because consumers in small towns, as the literature noted, have access to alternative sources of water, and because small towns, by their very nature, have limited access to resources, economic and human, investigating the effectiveness of different management models can only be done in the context of an understanding of the effective demand for water by the consumers.

Based on the main objective and sub objectives developed, Chapter Three focuses on the relevant data collection strategies and instruments used to gather the needed data to appraise the research objectives.

CHAPTER THREE

3 Methodology

"If it cannot be measured it cannot be managed" Peter Drucker (1909 – 2005)

3.1 Introduction

Following the discussion of the research aim and objective and justification in chapter one, along with the development of the second research objective and an introduction of sub objectives in Chapter Two, this chapter discusses the methodology used in collecting the relevant data to appraise the research by focusing on the research objectives.

This chapter also provides the assurance that the appropriate procedures and methods were followed during the study.

The research has taken advantage of the, perhaps unique, opportunity to be able to study four different small towns management models in one country. Generally countries attempt to switch management models at the same time for all service providers making parallel investigations impossible. The research methodology can therefore be summarized as undertaking field visits to each of the sample of small towns in order to investigate both the supply side (institutional characteristics and performance of the service providers) and the demand side (consumers views and practices in accessing water) in line with the two main research objectives. The research plan was necessarily designed to capture seasonal variations in the water supply situations in the towns, hence the fieldwork was conducted during two separate periods with each fieldwork gathering data largely to fulfil one of the main objectives.

The first phase of data collection, which focused on the first main objective regarding the value of the different management models, was undertaken between April and September 2007 and it provided the opportunity to understand the effect of any seasonal changes from dry season into rainy season. The second period of fieldwork which focused on the second main objective related to household demand was undertaken between October 2008 and January 2009, providing the seasonal changes from the rainy season into the dry season.

In social research there are different approaches available to be adopted in gathering the relevant data in order to answer some specific research question, proposition or problem. As each of the different approaches (experiments, surveys, archival analyses, histories and case study) has peculiar advantages and disadvantages, Yin (2009) suggests three conditions that occasion which approach to use. These three conditions have been stated to relate to, the type of research question posed, the extent of control an investigator has over actual behavioural events and finally the degree of focus on contemporary as opposed to historical events (Yin, 2009). The relationship between the three stated conditions to the five major approaches has been captured in Table 3.1.

Table 3.1 Relevant situation for different research methods

Method	Form of research question	Requires control of behavioural events	Focus on contemporary events
Experiment	how, why?	yes	Yes
Survey	who, what, where, how many, how much?	no	Yes
Archival analysis	who, what, where, how many, how much?	no	yes/no
History	how, why?	no	No
Case study	how, why?	no	Yes

Source: COSMOS Corporation as cited in (Yin, 2009):pp8

To respond adequately to the research objectives, the assessment of the institutional characteristics and performance of the service providers, “how” and “why” type questions of the different water systems are most suited. Robson (1993): pp147 citing Whyte (1981) suggest that, studies of organisations and institutions policy implementation and evaluation, management and organisational issues, organisational cultures and processes of change and adaptation, require the use of case study research. A case study is said to be suited for this research as it tries to illuminate a set of decisions: why they were taken, how they were implemented, and with what results (Schramm, 1971) as cited by Yin (2009). However, consumers’ views and practices in accessing water are well understood when "who", "what", "where", "how much" and "how many" type questions are posed in a survey.

As a multiple case study research the first phase of the fieldwork was used, in addition to data collection, as an exploratory phase for the second phase which focused largely on household surveys.

The chapter is organised around the two fieldwork phases described above and the structure of the chapter is as follows:

- Section 3.2 describes sampling strategy and data collection methods used in fieldwork one
- Section 3.3 describes the nature of data collected, sampling strategy and the design and administration of the questionnaire used in fieldwork two.
- Section 3.4 describes the data analysis techniques used.

3.2 Fieldwork – Phase one

3.2.1 Sampling of small towns for study

Available records show that in Ghana, out of the 336 small towns (Owusu, 2005), there are 287 small towns water supply systems in operation (Manu, 2001) of which about 80[1] under GWCL operations with 2 (now 3 or 4) under private management. The spread of these management models is not uniform across the regions in Ghana.

In conducting research on these small towns water supply systems, subject to time and resource constraints, limited access and availability of research assistants and logistics, the research developed a sampling strategy (Robson, 1993; Wengraf, 2001). This strategy involved two different sample frames. The first frame is the 287 small towns with operational water supply systems and the second is the entire population of the towns from which informants were sampled.

[1] This is an estimated figure taken from GWCL headquarters in Accra.

In sampling the small towns for this research, Ghana was zoned into three as shown in Figure 3.1 below, based on geographical, hydro geological and socio-economic spread of Ghana:

- Northern zone, comprising Upper East, Upper West and Northern Regions,
- Middle zone, comprising Brong Ahafo, Ashanti Regions and the northern part of the Volta Region.
- Southern zone, comprising Western, Central, Eastern, Greater Accra Regions, and the southern part of the Volta Region.

In the northern zone, the small towns water supply systems are largely community managed with just few being managed by the Ghana Water Company Limited (GWCL). In the middle zone, there are two private contracted operators (the only ones in Ghana as at 2007) managing the water systems on behalf of the WSDB. There are also in the zone, community and GWCL managed systems. In the southern zone there are both community and GWCL managed systems but more GWCL managed systems than can be found in the northern zone.

In sampling the small towns based on the management models and their spread in the three zones, the two private operated systems in Atebubu and Bekwai were considered for data collection to represent private sector participation models. In the northern zone two towns, Salaga and Bole were sampled from the list of community managed systems and Damongo sampled from the list of the few towns under GWCL management in the zone. Selection of towns in this zone was done with the support of the Northern Regional Director of CWSA based on sources of raw water, the practical necessity of the travelling time from researcher's base to case study town not exceeding three hours within the zone and the age of the water system being not less than two years old. At the time of data collection in 2007, GWCL had pulled out of the Damongo due to the diminished level of the raw water source. The town is currently relying on emergency systems provided by the European Union and managed by the District Assembly through the DWST. Data was collected from Damongo despite it being no longer under GWCL, in order to learn from the emergence of the new management model (District Assembly managed system). In the southern zone where there is a larger number of

GWCL managed systems two towns, Apam and Sogakope, were randomly drawn from a list of GWCL managed systems provided by an officer at the Planning and Research Unit at GWCL Headquarters in Accra. All the names of the 38 towns provided were written on pieces of papers and drawn one at a time from a plastic bag after they were thoroughly mixed. Asiakwa was similarly drawn from the list of all 103 community managed systems within the zone provided from CWSA Headquarters in Accra.

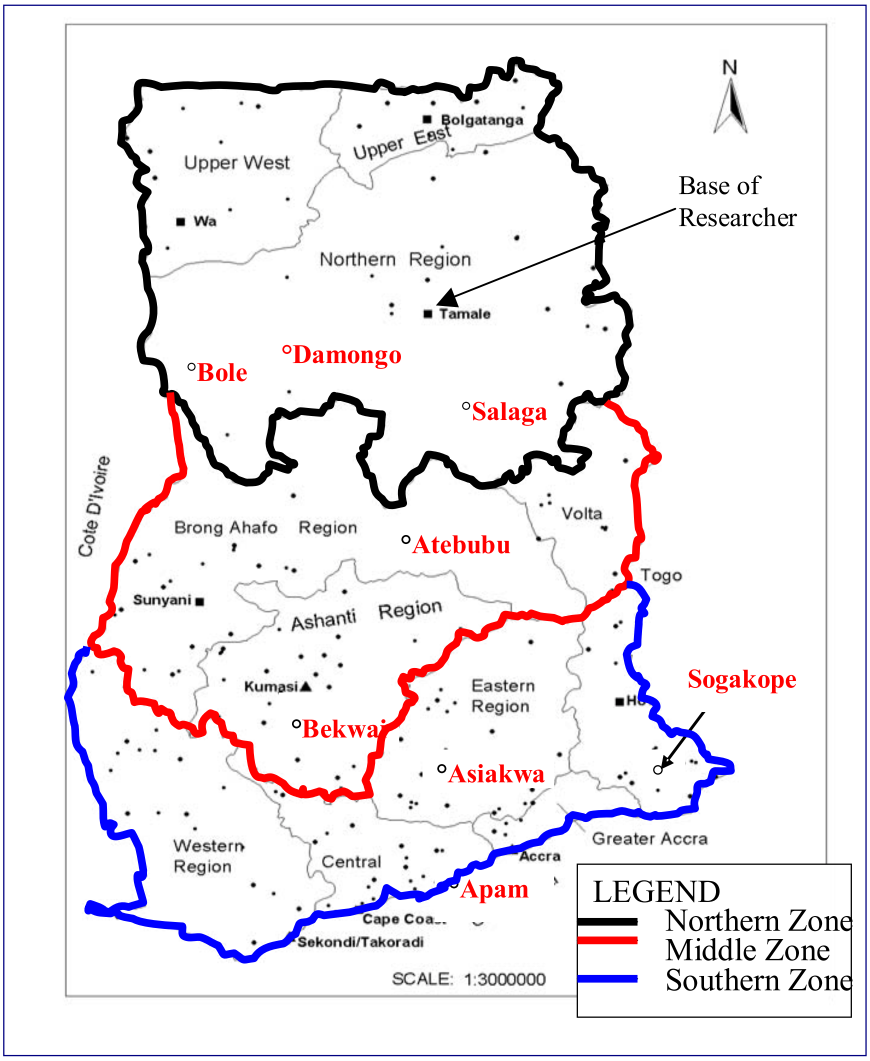

Figure 3.1 Map of Ghana showing the three zones and eight small towns investigated

Source: Author's elaboration from Owusu (2005)

In all, eight towns were sampled for data collection, that number being pragmatically based upon the resources of an individual researcher with limited support. The sampled towns show an equal mix of both ground and surface sources as raw water sources. This mix is relevant to this research as the type of raw water used by a water supply system has cost implications on the operations of the systems and hence the financial performance. Water supply systems that rely on surface water as their raw water sources have additional costs for investment in treatment plants and on recurrent operations as chemicals have to be purchased for flocculation and disinfection.

The table below summarises the towns selected in each zone, the source of raw water and management model.

Table 3.2 Small towns sampled for data collection, their management models and source of raw water

Small town	Zone	Source of water	Management model
Apam	Southern	Surface water	GWCL/AVRL
Asiakwa	Southern	Ground water	Community managed
Atebubu	Middle	Surface water	Private operator
Bekwai	Middle	Ground water	Private operator
Bole	Northern	Ground water	Community managed
Damongo	Northern	Ground water	District Assembly[2]
Salaga	Northern	Surface water	Community managed
Sogakope	Southern	Surface water	GWCL/AVRL

Note: In 2006 the government signed a five year management contract with Aqua Vitens Rand Limited (AVRL) to manage all GWCL systems with a reformed, much smaller GWCL remaining responsible for the fixed assets.

The distribution of the number of towns per zone in this research is more representative of small towns water supply compared to two previous investigations by Pilgrim (2002) and Eguavoen and Youkhana (2008). In the performance assessment of small towns water supply systems in Ghana conducted in 2002, (Pilgrim, 2002) selected only community managed systems, six (6) towns from the middle zone and three (3) from the southern zone with no town selected from the northern zone. Investigating the management of piped water systems in small towns after the water sector reforms in Ghana, Eguavoen and Youkhana (2008), subsequent to this research starting, selected seven (7) towns from the Upper East Region, one (1) town from Upper West Region, all in the northern zone and community managed, and Atebubu and Bekwai in the middle zone and privately operated. No town from the southern zone was included.

[2] As at the time of the first fieldwork the water supply system in Damongo was under the management of the District Assembly through the DWST because the GWCL system was out of order.

3.2.2 Sampling of Informants

As a case study research, which involves different data sets, different categories of informants were sampled for data collection. The sampling and subsequent data collection was to ensure that adequate and appropriate data were collected to ensure that the management models are adequately investigated. The two groups of informants for the first fieldwork of the research were categorised into three;

- National level informants
  - Officials at the Water Directorate of the Ministry of Water Resources Works and Housing.
  - Officials of Community Water and Sanitation Agency
  - Officials of Ministry of Local Government and Rural Development
- Town level informants
  - Officials of the District Assembly and DWST
  - System operators and WSDB
  - Customers in the eight towns

At the national level and the District Assemblies, the informants were purposively sampled (Robson, 1993; Bernard, 2006) to gather information on policy and institutional issues that could influence the performance operators. The Director of the Water Directorate at the Ministry of Water Resources Works and Housing, the Director in charge of Small towns at the Community Water and Sanitation Agency (CWSA) and the Chief Director at the Ministry of Local Government and Rural Development were sampled at the national level. At the District Assemblies of all the eight small towns sampled, the District Water and Sanitation Teams (DWST), District Planning/Budget Officers, the District Co-ordinating Directors and in some towns the District Chief Executives were sampled.

In each small town, the system managers and technical officers were targeted but in some towns the accounts officers were also invited into the discussions. For example, in Salaga the accounts officer was a more vital source of information than the system manager and the two technical officers because he is the longest serving staff member on the system and was able to provide historical accounts of the water supply system.

In sampling customers to interview in each of the towns, a systematic random sampling technique (Robson, 1993; Bernard, 2006) was adopted. The towns were divided into three imaginary portions (areas closer to, midway and farther away from the high lift tanks of the water systems) and in each portion, one group of people sitting together were sampled. The customer interviews served both for the purpose of triangulation of the data collected from the District Assembly/DWST and the service providers/WSDB, and capturing the variation in the water supply situation and how the variations are distributed (Bernard, 2006) in the towns. These variations were vital for the sampling strategy adopted in the second fieldwork. The validity and relevance of the data collected from the cross section of the customers did not depend on the sample size as they were qualitative in nature (Varkevisser et al., 2003a). The three sampled groups therefore provided the research with much useful data, an obvious advantage a case study methodology, which was adopted for this exploratory stage of the research, has over other methods such as quantitative surveys.

The detailed explanation of the methods and instrument used for data collection are discussed in the following section.

3.2.3 Data collection methods

In order to have flexibility at the exploratory stage of this case study research, multiple sources of data, which include documentary analysis, interviews and observations, were used (Yin, 2009; Robson, 1993). The use of these multiple sources of data gathering techniques in addition provided this research an opportunity for triangulation (Yin, 2009; Robson, 1993; Varkevisser et al., 2003; Bryman, 2005). The multiple data gathering techniques have also enhanced the interpretation of the data from the second fieldwork which was a survey (Robson, 1993).

The data collection methods used during the fieldwork are discussed in detail below.

Documentary evidence

Documentary evidence in data collection is considered to be an unobtrusive measure and is recognised to be 'stable, exact and with a broad coverage' (Robson, 1993). However, such evidence is prone to some bias such as 'false reporting' and may be difficult to access with the resulting advice that 'researchers must rely on them carefully' (Yin, 2009). This research therefore relied in addition to the annual reports submitted by the water operators to the District Assemblies, on bill payment records, receipts of expenditures and all available records detailing income and expenditure. These were used as a means of verification of the financial reports.

The following main documents were accessed to gather data for the research during the preparatory phase of the fieldwork.

- National Water Policy from the Water Directorate of the Ministry of Water Resources Works and Housing.
- Small towns water policy and other operational documents from the Community Water and Sanitation Agency (CWSA)
- Monitoring, evaluation and implementation reports from CWSA.
- Ghana Water and Sewerage Corporation Assistant Project (GAP)/Canadian International Development Agency (CIDA) documents from CIDA and GWCL offices in Tamale.
- Project disbursement documents of European Union (EU) emergency water supply intervention in Damongo.
- Financial and operational reports of system operators for the years 2005, 2006 and 2007.

Three years of financial and operational data were collected to establish whether there are any discernable trends in the performance of the operators over time. Investigating trends over time is considered to be very important as a way of measuring genuine performance (Alegre et al., 2006). In order to achieve this, the results are presented in three different chapters with each chapter focussing on one of the three main different management models.

There were significant challenges in accessing the financial and operational reports of the systems' operators, often different challenges in each of the towns surveyed, but the use of multiple contacts with the consultants who supervised the water projects during construction and the local District Assemblies resolved the issues. Some financial reports of some of the operators appeared not to be consistent, as the same figures compiled in a spreadsheet produced conflicting sums and in each case the report showed a better performance by the operator than the figures from the author's spreadsheet. For the purpose of this research therefore, the figures from the spreadsheet were used for the analysis.

Interviews

The first fieldwork phase, as described earlier, served in addition to collecting data, as a means of exploring the research field further with face to face interviews offering the necessary flexibility and adaptability (Robson, 1993). The face to face interviews offered the opportunity for follow-up questions based on responses and it also enabled judgement of non-verbal cues of informants. This advantage would have been lost if self-administered questionnaires were used. Interviews offered the advantage of focusing directly on the case under study and providing the research insights into each case (Yin, 2009). The disadvantages of interviews which this research took seriously are those that Yin (2009) described. The biases in interviews occur from both the investigator, who could introduce the biases when questions are not properly constructed, and from the informants through response bias, inaccurate recall and the tendency of wanting to tell the investigator what he wants to hear (Yin, 2009). This caution informed the evolution of the questions asked, restricting recalls to previous two years and also explaining to all respondents that the purpose of the research is academic and will not in any way influence Assembly and Government decisions regarding their water supply.

Semi-structured questionnaires were used during data collection because they are well suited when research targets "high-level bureaucrats and elite members of a community" (Bernard, 2006) as is the case in this research. Though the author conducted all interviews in this fieldwork himself, interview guides (See Appendices IA, IB & IC) were used for data collection to ensure that reliable and comparable qualitative data were gathered (Bernard, 2006) for the research.

In addition to interviewing all the informants sampled, the Team Leader of the CIDA sponsored District Capacity Building Programme (DISCAP), which has been involved in building the capacities of stakeholders in small towns water supply, was interviewed at his base in Bolgatanga. Bolgatanga is 160km from Tamale, the base of the author, and one of the shorter journeys this research required.

Different interview guides were used to collect data from the different categories of informants sampled in section 3.2.2 above. During each interview, in order that all information was collected, the interviews were recorded using a portable recorder when the interviewees permitted the recording. All interviewees were assured of confidentiality of all recordings and were also provided with the opportunity to ask for a stop to the recording if they so wished in the course of the interviews. In all 53 interviews were conducted during the fieldwork. All the recordings were manually transcribed by replaying the interviews in turn. Manually transcribing all interviews offered an advantage of listening to the interviews all over again highlighting very important comments. Please see Appendix II for copies of these transcriptions.

Subjective capacity descriptors

It has been noted Cullivan et al. (1988) that collection of performance indicator data alone is unlikely to capture the essence of water services management. It cannot reveal the human resources aspects as to why certain approaches succeed or fail.
Cullivan's WASH 37 approach were used to frame capacity specific questions so as to analyse key informant interviews and observations in order to assess the operators in terms of what Franceys (2006) calls subjective capacity descriptors. Each descriptor was assessed by choosing a level of agreement (1 – 5) with each of the multiple questions, as shown in one example in Table 3.3 below for the Leadership descriptor, with the rest found in appendix IV. In scoring, 1 was considered very low, 2 considered low, 3 medium, 4 high and 5 very high. The average of the scores for each descriptor was then used in the comparative analysis.

Table 3.3 Example of Subjective Capacity Descriptors

Subjective Capacity Descriptions	**Scores**
Leadership	
Provides clear sense of mission; involves people with mission; gets people excited about mission, believing in it.	
Serves as a positive role mode, hard-working, demonstrates competence, is visibly interested in work, and balances people needs with organisational needs.	
Shows sense of dynamism, enthusiastic, has an active 'can do', problem solving attitude.	
Demonstrates personal integrity, instils sense of integrity in others, and balances personal ambition with organisational needs.	
Is oriented towards producing results which move work towards meeting objectives.	
Identifies clear performance standards both at institutional and personal level and is strict but fair; gives positive and negative feedback where due.	
Visits staff at all levels of the organisation and all districts on a regular basis.	
Listens as well as instructs.	
Has sufficient operational and technical knowledge to inspire trust	
Total Score (Sum of all scores)	
Score	**Total/9**

Source: Cullivan, et al (1988) and Franceys (2006)

Observations

It is suggested that when a researcher wants to know what people actually do, there is no substitute for watching them (Bernard, 2006). Direct observations have been credited as covering the event in the context in which they happen and at the right time. The major setback of direct observation has been the research time it consumes (Yin, 2009). The research time was not consumed by the observations made by the researcher as it was accounted for at the design stage in terms of additional time and also because the researcher was living among the people.

In each of the eight towns, direct observations of water supply services were recorded and these observations were the key inputs into the subjective capacity descriptors discussed in Chapters Four, Five, Six and Eight. Samples of information used in the subjective capacity descriptions are found in Appendix IV. Observations such as queues at public standpipes, hours of flow of water in day, working relationship among staff of the water service providers, the nature of the raw water source, households’ water consumption per day, how operators carried out their duties and staff related to each other were made. All observations were recorded timely in a ‘field notebook’.

3.3 Fieldwork – Phase two

Fieldwork one provided information focusing on the supply side of the provision of water services and the level of services delivered to customers as perceived or measured by the providers and it was largely to meet the first main objectives. The second fieldwork phase acted as a follow up to the first phase and, reflecting the second main research objective, provided the information on the demand side of the provision of water services, investigating the level of services consumers are receiving either from local or alternative (or self) service providers. It was also used to fill in the gaps of fieldwork one. Fieldwork two was largely focused on the household surveys to ascertain the characteristics of household demand for water supply services and how the demands are expressed. It was also used to collect data on the capacity of households to express their demand for water supply services, particularly in financial terms, relative to other services accessed.

Household surveys have been in existence globally for over two centuries now and have been used to collect information on households required by governments for policies that target specific groups of the population (Grosh and Glewwe, 2000).

There are no specific rules in designing household surveys but the design must fit into the objectives of, and constraints on, the proposed survey (Grosh and Glewwe, 2000). In maintaining the reliability of the household data collected within the constraints of time and budget, a sampling strategy that captured the variations that exist in the towns from fieldwork one was used (Frazer and Lawley, 2000).

In determining the capacity of household to express their demand for paid water supply services it was considered advantageous that the wealth of the households might be determined. The wealth of households in each town represents the pool of resources that need to be tapped to fund the water supply systems in the long term (Low, 2005).

3.3.1 Household data collected

It was determined that the data collected at the household level should include: household characteristics, household income, household sources of water and distances from household places of dwelling to their sources of water. In addition the cost to a household for the provision of large storage facilities for water, the consumer satisfaction of the service provided, household expenditure on water, electricity and mobile phones was investigated. The household data collected is described in more detail below with sample questionnaires available in Appendix III.

Household characteristics

Household characteristics such as household size and the number of households per compound house influence the demand for and coverage of water supply services. Household size enables the determination of per capita water consumption and per capita income of households to be determined. Per capita income of a household is considered a better measure of household's ability to make decisions of trade-offs between competing demands because direct household incomes hide the demand exerted by large numbers sharing the income (Tippe et al., 1997; Spencer, 2007).

Household income

The measurement of household wealth, which serves as the pool of resources businesses and service providers can tap into, is considered a difficult task and instead incomes are measured by analysts who consider annual inflow of income as the appropriate measure of household wealth (Low, 2005). Measuring annual inflow of household income is not without challenges as people in trading or self employment usually have difficulties in differentiating between incomes and capital (Tippe et al., 1997). Household members in formal employment are also only willing to provide information on their basic incomes excluding any allowances, 'dash' or bribes and therefore such reported incomes are most likely to be unreliable (Tippe et al., 1997; Morris et al., 2000). Therefore in determining the component sources of household incomes in the study towns the following aggregates are recognised to be reasonable estimates: sales from agricultural products, remittances received, wages and salaries of members in formal employment, incomes from businesses of household members, house or land rented out and any other sources. The questionnaire as discussed in section 3.3.4 was tactically done to overcome the challenges of misreporting of household incomes. The "any other sources" column of the income sources provided the screen for household members to report on any income that they are not willing to declare the source.

In determining household wealth, some researchers use proxies for wealth such as household assets to estimate household income in order to avoid collecting data that have been misrepresented (Morris et al., 2000). However there are good examples of research that relied on household income data solicited directly in Ghana and in Vietnam. In determining household demand for intermediate means of transport in the Nanumba districts of Ghana direct household incomes were solicited (I T Transport, 2004). In order to provide a measure of capacity of households to connect to a new water supply systems in a per-urban community of Vietnam, direct responses on household incomes were collected from nine income sources (Spencer, 2007). The direct approach was therefore taken.

Households' sources of water

In small towns where pollution of natural water sources is minimal relative to the sources in urban towns, households may still depend on these original sources. The performance of the formal water supply systems in small towns depends on household demand and willingness to pay charges for their 'improved' services relative to the resources used in accessing the alternatives. There is a particular issue also with regard to wet season and dry season alternative sources.

Accessibility of the water sources in terms of the time it takes a household member to go to fetch water and the distance from the household's location to the alternative sources also influences household demand for water supply services. A water source is said to be easily accessible if a member of a household makes a round trip in search of water of not more than 30 minutes (WHO and UNICEF, 2000) and/or the walking distance is not more than 250m (IBNET, 2005).

In measuring distances from any household location to their main and alternative sources of water, the odometer of a motor bike was used. First any house that was sampled was given a serial number coded with the name of the section and after the interview with a household the distances were taken from the house to their reported main and alternative sources of water.

Cost of large household water storage facility

Households often use large storage facilities as a safeguard against times of water shortages. These are often an indication of the level of reliability of the water supply systems in the towns. It is usually the rich in the communities who purchase such water storage facilities and they have been described as the "hidden water economy" (Serageldin, 1994). Serageldin (1994) explains that the resources used in acquiring such storage facilities could have been released into the system if water supply operators met the customer demand. It was found that a negligible proportion of households in the eight towns possess these storage facilities, either purchased or constructed, and therefore no further attention was given to this issue.

Household expenditure on water, electricity and mobile phones

To investigate the research problem and proposition in sufficient depth it was decided that collecting household expenditure on water, electricity and mobile phone would enable the research to establish household priorities in terms of network services. This would uncover, it was hoped, the extent to which there might be a challenge regarding affordability of water services as opposed to effective demand. Generally in determining the affordability of water tariff to households, a percentage of that household's income is used as a simple measure. However this research has provided a new slant to match the measured 'affordability' level against household preferences. Government policy on electricity in Ghana has ensured that all small towns are connected to the national grid. Mobile telephony in Ghana has also expanded rapidly over the years and as at September 2008, it was reported that 8.7 million of the estimated 23 million Ghanaians use mobile phones (Peace FM, 2008). According to the 2000 population census, the average household size in Ghana is 5.1 (GSS, 2008) and this means that in each household in Ghana you can find about two phones. This provides the platform for comparable data on electricity and telephony to be collected in each town.

In order to achieve triangulation of households' expenditure on mobile phones which are not recorded, unlike for water and electricity, sales by mobile phone vendors were collected. The mobile vendors deal in recharge vouchers, unit transfer, calls and phones and accessories.

3.3.2 Customer satisfaction survey

Soliciting the views of customers on their satisfaction with the water supply services they receive from the service providers is essential in assessing their demand for water from these service providers as they are in direct competition with the available and 'free' alternative sources. In any competitive industry, customer satisfaction, distinguishes the competitors and organisations could use it as their performance indicator (Kaplan and Norton, 1996). So important is orienting business objectives towards customer satisfaction that the customer perspective features prominently on the 'balanced scorecard' (Kaplan and Norton, 1996). The importance of customer satisfaction in the success of any competitive business has been emphasised further by (Michel et al., 2008).

On a scale of 1 to 6, where 1 is very satisfied, 2 is satisfied, 3 is neither satisfied nor dissatisfied, 4 is dissatisfied, 5 is very dissatisfied and 6 is don't know, customer satisfaction of the following were solicited:

- Water tariff of the service provider
- Water quality from taps
- Average hours of water flow in a day
- Complaints handling by service providers
- Water pressure at taps

The 1 to 6 scale was used to limit the noticed tendency of respondents to choose the middle or average scale of 3 in a 1 to 5 Likert scale.

During the data collection it was realised that in some Ghanaian languages, especially from the north, it is difficult to distinguish between satisfied and very satisfied and dissatisfied and very dissatisfied. Therefore in analysing the data very satisfied and satisfied records were considered as meaning the same and dissatisfied and very dissatisfied were also considered the same.

3.3.3 Sampling strategy

In planning any survey, particular attention must be given to the sample to be investigated as the sampling plan affects how dependable the survey will be (Robson, 1993). Any research that solicits data on individual attributes such as "income, or preferences," requires "a scientifically drawn, unbiased sample" (Bernard, 2006). But when shared issues (such as water supply issues) are the data set required for the research, non probability sampling is equally appropriate (Bernard, 2006).

In all eight small towns where data was collected, the towns were divided into sections based on religious beliefs, ethnicity, social stature, etc or a combination of these factors as shown in Table 3.4.

For example the ‘zongos’ are predominately of people from the northern parts of Ghana living in the south, migrants from northern parts of West Africa and Muslims and the bungalows are largely occupied by the elite government officials. In addition to these categories, topographical issues were also of importance in the sampling strategy. For example in Damongo, a section is named “in the wells” because that part of the town is considered the lowest part of the town and is in a valley where wells have been dug to store water for public use. Therefore in sampling houses for household surveys, each town was stratified along these lines.

In each stratum households’ experience of water issues and their socio-economic conditions do not vary significantly so small samples were surveyed (Robson, 1993). In order that unbiased samples are drawn from the households within the strata, systematic random sampling was adopted to sample both the houses and in each sampled house a household. A sample size equal to 1% of the number of households in the town was used in each town and one household was surveyed in each house. The 1% sample size provided a total of 285 households surveyed in the second phase of the fieldwork in addition to 53 interviews conducted in the first phase in all eight towns. As a rule of thumb, Perry (2002), suggests that “PhD research requires at least 350 respondents in a quantitative survey or at least 35 to 45 interviews in four to twelve qualitative case studies”. This research is however a unique one, which combined 285 quantitative surveys and 53 interviews in eight case study towns with four management models.

In each stratum, the biggest tree was identified as the start point for sampling houses. Beneath the tree a coke bottle was spun and the immediate house in the direction pointed to by the bottle was the first house to be sampled. The survey then sampled

every 10th house in that same direction. In cases where the number of houses in the direction of the bottle were fewer than required to achieve the desired sample size for the stratum we returned to the tree and repeated the spinning and then followed the same process in the new direction. In each sampled compound house the household whose door was directly facing the entrance into the compound was surveyed.
The limitations to having larger sample sizes for each town were the insufficient funds available to pay research assistants and to print more copies of questionnaires. The time required to complete the administration of questionnaires on larger sample size was another limitation.

Table 3.4 Small towns and their population, households and number of strata

Small town	Estimated population (2008)	Average household size	Number of households per house	Estimated number of households	Sample size	Number of strata
Apam	19,477	4.3	2.6	4,530	46	3
Asiakwa	10,030	3.9	1.9	2,572	26	2
Atebubu	24,397	4.6	2.0	5,304	53	4
Bekwai	25,716	5.0	2.9	5,144	52	5
Bole	10,376	5.2	1.6	1,996	20	2
Damongo	18,153	5.9	1.3	3,077	31	4
Salaga	21,000	6.0	1.9	3,500	35	3
Sogakope	8,534	4.0	2.1	2,134	22	2

Source: Derived from 2000 population and housing census in Ghana with author's addition.

3.3.4 Questionnaire design and administration

The questionnaire used in data collection was designed for face to face interviews and inputs from the first fieldwork phase ensured that the traditions and culture of the people in the towns were taken on board, in addition to other ethical considerations. The questionnaire was also designed to ensure that data collected through the face to face interviews with respondents was accurate.

Brace (2004) critique of face to face interviews is that they do not provide entirely accurate data. That, along with ambiguous questions, order effects between and within questions and the respondent's bias of saying what sounds good to the researcher, are some of the sources of inaccurate data. The design of the questionnaire therefore adapted and modified the works of other researchers in household surveys and from the literature (Frazer and Lawley, 2000) to ensure that accurate information was collected.

In designing the questionnaire, sensitive questions such as household characteristics and household incomes were put at the end (Frazer and Lawley, 2000; Brace, 2004) in order to attract the full cooperation of respondents. In dealing with such sensitive questions, in addition to assuring respondents of the confidentiality of the information provided as an introduction to the survey, further assurance of respondents were made before those questions were asked (Brace, 2004).

In the questionnaire, three different response formats were adapted from Frazer and Lawley (2000) and Brace (2004) which include:

- Open–ended questions, which were used where there were different possible responses and the precise response is only known to the respondent.
- Close–ended questions which were categorised into three:
    - Single close–ended questions, where a single response is required such as ‘how much a household spent on water in a month’
    - Dichotomous close–ended questions, where two response items were provided such as ‘yes or no’
    - Multichotomous close–ended questions, where several alternatives are listed such as the ‘alternative sources of water’
- Scaled–response questions, which were used to measure attitudes such as in the customer satisfaction survey. In this research the numbers of the itemised scale in the customer satisfaction survey were limited by the equivalent translation into the different Ghanaian languages. As noted earlier, with no distinction between excellent and very good, very poor and extremely poor, very satisfied and extremely satisfied etc. this must be considered at all times when any survey involves translations to a second language.

The use of ‘show cards’ as prompts was not considered in this survey due to the high rate of illiteracy population in Ghana more particularly in the rural areas such as small towns. The average literacy rate in Ghana according to the 2000 Population and housing census is 57.9% (GSS, 2005) and so all questions were so structured and formulated to allow for easy translation into the Ghanaian languages.

In piloting the questionnaire, a “cognitive method” (Bernard, 2006: pp286) was used on five households in Bole, spread across the two strata. Bole was chosen for piloting the questionnaire for two main reasons. First to ensure that all the questions could be translated into Ghanaian languages as the author speaks the same language as the people in Bole. The second reason is because of the relatively smaller sample size, which allowed time for fine tuning the questions.

Piloting the questionnaire also served as part of the training for the two research assistants recruited in Bole. Households who were surveyed during the pilot were not included in the main survey. Lessons learnt during the pilot phase of the survey, were adapted to ensure efficient data collection. For example the research adopted the rule that when a household in a compound house declines to be surveyed, no other household is surveyed from the same house, because we realised the second household is not always ready to participate either.

Ghana is a language/dialect diverse country and in conducting household surveys where more than 40% (GSS, 2005) of the population is illiterate one is confronted with the challenge of how research assistants are recruited. In each town, new research assistants were employed to ensure that translation of questions does not alter the original import of the questions. This same challenge had also compelled other researchers to resort to employing research assistants within their localities for reliable data collection in Ghana. Language and reading barriers were overcome by Bawumia (1995) by employing native speakers of the indigenous languages/dialects as translators his research in Ghana. The obvious advantage of having the same set of research assistants in all the towns could therefore not be utilised. However, there were very important advantages that accrued to the research by using natives as research assistants.

- Stratifying the towns for data collection was enriched by the local knowledge of the native assistants and each stratum was assigned to a research assistant with adequate working knowledge of the area and the proportional distribution of the questionnaires to the different strata in the towns were based on their input.

- As the research solicited sensitive data from households, the use of natives nullified the anxiety of respondents about the purpose to which the data collected will be used. There was trust between research assistants and respondents as they know each other.
- As the data collection period coincided with the 2008 national electioneering period in Ghana, the use of natives of the towns allowed for the employment of some known supporters of both of the two leading political parties that ensured the results were not biased by politics. For example in Bole where the Vice Presidential Candidate of one of the major political parties hails from, people got interested in what the research assistants were doing together. The interest of the towns' population was translated into 100% response rate in all eight small towns.

In all 25 research assistants were employed in the eight towns and were drawn from the local senior high schools. In each town the research assistants were given a day's training which involved trial surveys. Each assistant holds bachelor's degree or higher qualification and during data collection they were all monitored by the author, providing additional support where it was required.

3.4 Data analysis techniques

Data analysis as suggested by Bernard (2006) starts before data collection because researchers have ideas about what they are going to study and that data analysis is a continuous process in any research. Data analysis involves the examination, categorisation, tabulation, and tests of both quantitative and qualitative evidence to enable the address of the initial propositions in the study (Yin, 2009). The two fieldwork phases adopted different data collection tools because of the nature of the data required for each main objective. Phase one, as described in section 3.3, was largely qualitative research, while phase two was predominantly quantitative research and the techniques for their analysis differed.

In analysing data from phase one, International Water Association (IWA) performance indicators for water supply services and the International Benchmarking Network (IBNET) toolkit were used (Alegre et al., 2006; IBNET, 2009). As strategies and techniques for analysing case study evidence are not well defined, Yin (2009) suggests that researchers' familiarity with various tools and manipulative techniques are useful. The operational data of the eight service providers were combined to generate the performance indicators according to IWA and IBNET standards which were then compared with the internationally acceptable targets as well as the target values of the Community Water and Sanitation Agency (CWSA). As the small towns in which the management models were investigated are just eight no meaningful conclusion can be reached by using statistical analysis.

An Excel spreadsheet was used for the analysis of the quantitative data from phase two. The analysis was to ensure that a comparison can be made between what service providers offer and what households receive and also between the different consumer groups. The mean, which is a central tendency measure of a sample, is the sum of all observations divided by the number of observations. The other available statistical measures that represent central tendency are the median and the mode. Whilst the median represents the midpoint of the data distribution, the mode is the most frequently occurring data value (Lane, 2008). As the sample sizes in the individual small towns are relatively small, the median would have been a better measure of the central tendency to avoid the influence of outliers which usually affects the calculation of the mean (Wright, 1997). However, data from the small towns are providing similar figures for the mean and median and as the research have set itself to ensure that each data contributes to the central tendency estimates, the mean was therefore used as the measure of central tendency. The standard error of the mean which represents the standard deviation of the means of all possible samples in each of the small towns was therefore introduced to allow for, if any, extreme sample means (Wright, 1997) and represented as error bars on the charts. This research however, recognised that the standard error as is used here refers to an estimate of the standard deviation which is usually said to be an unknown quantity in practice and therefore a statistical test (t-test) which provides a confidence for an estimated mean or difference of means is a favoured option (Lind and Mason, 1997). Lind and Mason (1997) has shown that in order that the sample means of two different populations are compared to decide whether there are any differences in the means, the t – test is the appropriate statistical test. It is however recommended that where three or more sample means are being compared to establish statistically whether there are significant differences in the means or not, the analysis of variance (ANOVA) is considered the most appropriate statistical tool (Bekiro-lu, 2001; Lind and Mason, 1997). In this research as the means of eight small towns are being compared ANOVA was therefore used to establish if there are any significant differences in the means of the towns.

In using the analysis of variance to establish whether any significant differences exist between three or more sample means the significance of a statistic, F, the F-ratio, must be established. F is calculated by the ratio of the mean square (MS) between the towns to the mean square within the towns. The mean squares (MS) are determined by first determining the sum of squares (SS) between (these measure the variability among and within the towns) and within the towns and then dividing the SS separately by the respective degrees of freedoms (df) (Lind and Mason, 1997). In making the decision about the significance of any differences in the sample means of the eight small towns, a null hypothesis (H_0: $\mu_0=\mu_1= \mu_2=\ldots\ldots= \mu_8$) and the alternative hypothesis (H_1: $notH_0$) are stated at a level of significance which this research, going by Lind and Mason (1997) recommendation set at 0.05 (5%). The authors indicated that for consumer research projects 5% level of significance is considered appropriate. According to Lind and Mason (1997) when analysis of variance yields F that is greater than or equal to $F_{critical}$, (that is if $F \geq F_{critical}$) then the null hypothesis, H_0, is rejected and the alternative hypothesis, H_1, is true. $F_{critical}$ is obtained from statistical tables. The analysis tool in excel 2007 was used to carried out the analysis of variance (Single Factor) and the results tables generated are included with the text in the Chapter.

3.5 Reflections and conclusions on methodology

The straight line distance between the two small towns which are furthest apart is approximately 475km. The average distances from the researcher's base in the Northern town of Tamale to the small towns in the Northern, Middle and Southern zones are 130km, 255km and 405km respectively. This gives an indication of the challenges faced by the researcher in making best use of the opportunity to investigate different management models in all three zones of Ghana. The researcher also faced the considerable task of making appropriate contacts with government and stakeholders in each location, without any national host for this research, in addition to identifying and recruiting local research assistants.

Overall, the research critically considered the different data collection strategies and the most useful and relevant methods were used, while minimising the challenges that they posed on collecting accurate data. In this chapter it has been demonstrated that the most appropriate procedures were followed in the sampling of towns and respondents, in the design and administration of data collection instruments, and that relevant tools were used in the analysis of data collected from the two fieldworks. All procedures have been justified and the needed evidence provided that those procedures have been followed. It was established during data collection that in order to gather reliable data the researcher needed to have some local knowledge of the area as the basis to check data collected by research assistants as some may attempt to fake data. Close monitoring and the use of key District Assembly staffs help to resolve some tendencies that would have biased the data to be collected. It was obvious that self-administered questionnaires are not appropriate for all small towns visited.

In the next four chapters the author focuses on the analysis of the data collected from the two periods of fieldwork which are presented to reflect the main and sub-objectives of the research. It was thought that presenting the household demand data, the stage would have been set to investigate the management models. However in the view of the first main objective to investigate the management models whose understanding generated the second main objective to investigate households' demand for improved water, the author decided to present the results of the management models before the household demand. The three main management models are presented in separate chapters to enable analysis of each model, to develop further understanding and to check if there are any differences or trends within the management models. Chapter

Four therefore analyses data on the community managed model, including the District Assembly managed model as explained earlier, Chapter Five presents the private operator managed systems and Chapter Six focuses on the public utility systems. Chapter Seven analyses the household data required to determine effective demand for these water supply services.

CHAPTER FOUR

4 Performance of community managed water supply systems in small towns in Ghana

4.1 Introduction

In Chapter One, four different management models in operation in small towns water supply in Ghana were discussed. This chapter presents the results of the investigation of the performance of the three community-managed water supply systems, and the only District Assembly managed system, to establish any trends and to compare the operators to find out if there are any significant differences within the community managed model. As there is no other District Assembly managed system to compare with the Damongo (in the North of Ghana), the research compares its performance with the community managed systems. Chapter Five and Chapter Six present the results of the investigation of the contracted private operators and the public utility managed systems respectively. The results obtained are from data collected during fieldwork in 2007 & 2008. The community-managed systems investigated are Asiakwa in the East, Bole and Salaga in the North. The three community managed systems are examples of delegated system of management discussed in Chapter Two. The District Assembly as the local government authority transferred the provision of water supply service function to the WSDB in line with the NCWSP guidelines discussed in Chapter One.

In this chapter, based on literature, the distinguishing features of the community managed models to be confirmed or otherwise alongside any new discoveries include the following:

- Management of the water supply systems are carried out by community committees or their appointed operators (Bolt ad Fonseca, 2001). In selecting community members to operate water supply services in the true community managed systems, the community on their own and due to the communal type of living, identifies reliable and committed community members as committee members or operators who usually are volunteers and do not require any payments for their work thereby reducing the cost of manpower employed.

- Community participation and consultative processes are used to arrive at decisions regarding water supply projects (Lockwood, 2004; Harvey and Reed, 2006). In a true community managed service provision in the context of rural Ghana through participation and consultative processes, issues such as payments for services and community contribution are carried out with knowledge of economic and social stature of community members. Payments or contributions are not made uniformly, with the wealthier households paying more than the poor. The poor are also made to make payments in the form of farm produce (both crops and livestock) which are sold and the money put into the water supply savings accounts or they offer labour as their contributions or payments. In some rare cases wealthier households make payments or contributions for the poor.
- Accountability of system managers to the entire community (Bolt and Fonseca, 2001) through regular community meetings.

4.1.1 Case studies context

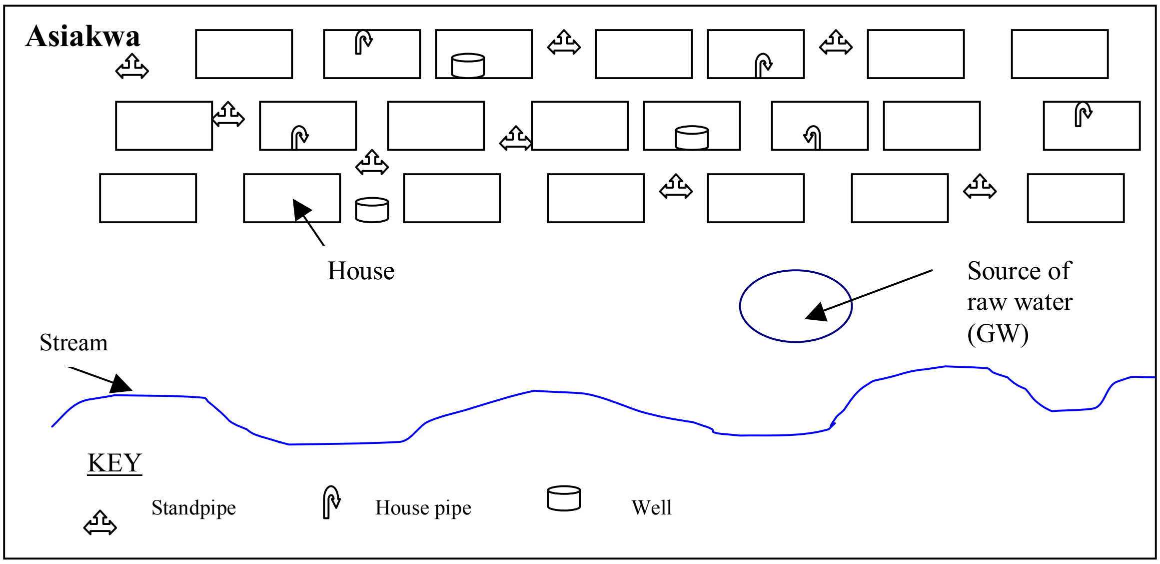

Figure 4.1 Schematic Diagram of Asiakwa

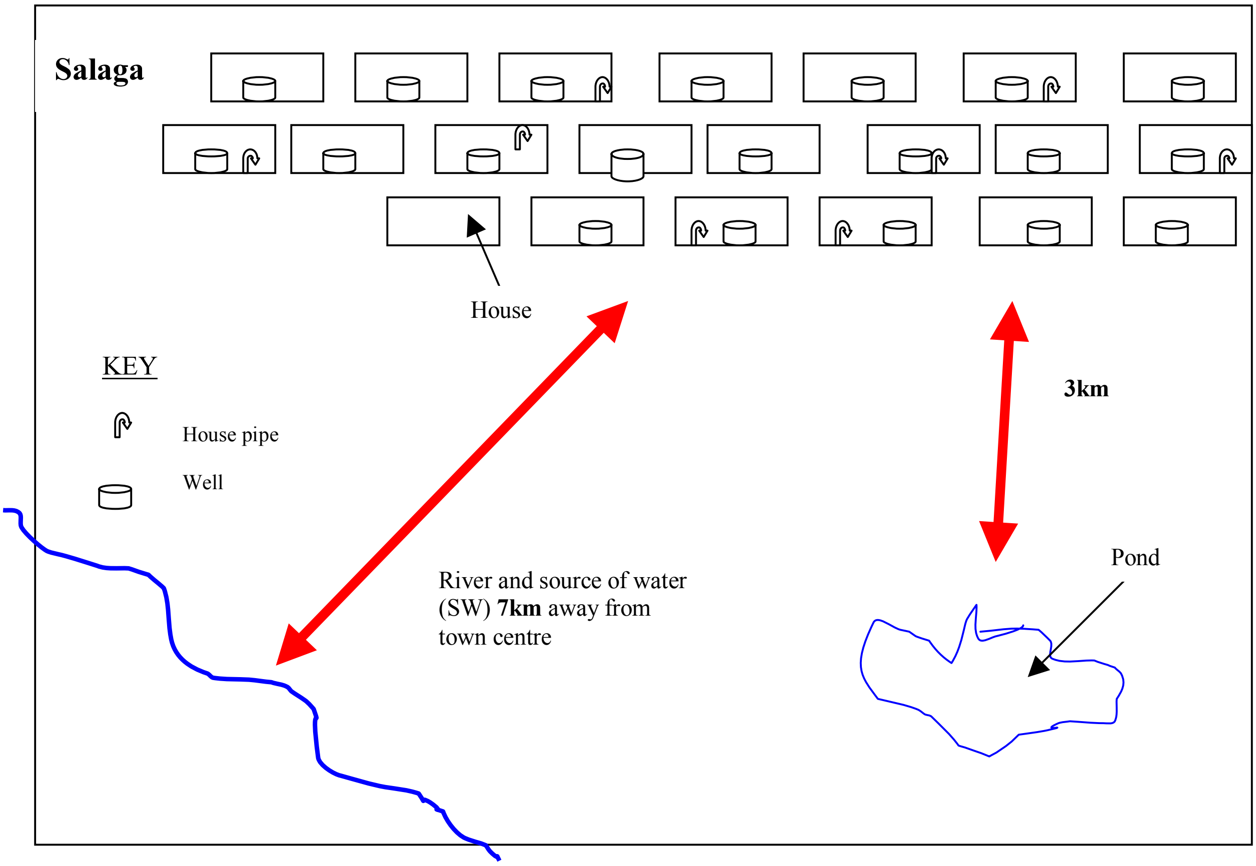

Figure 4.2 Schematic Diagram of Salaga

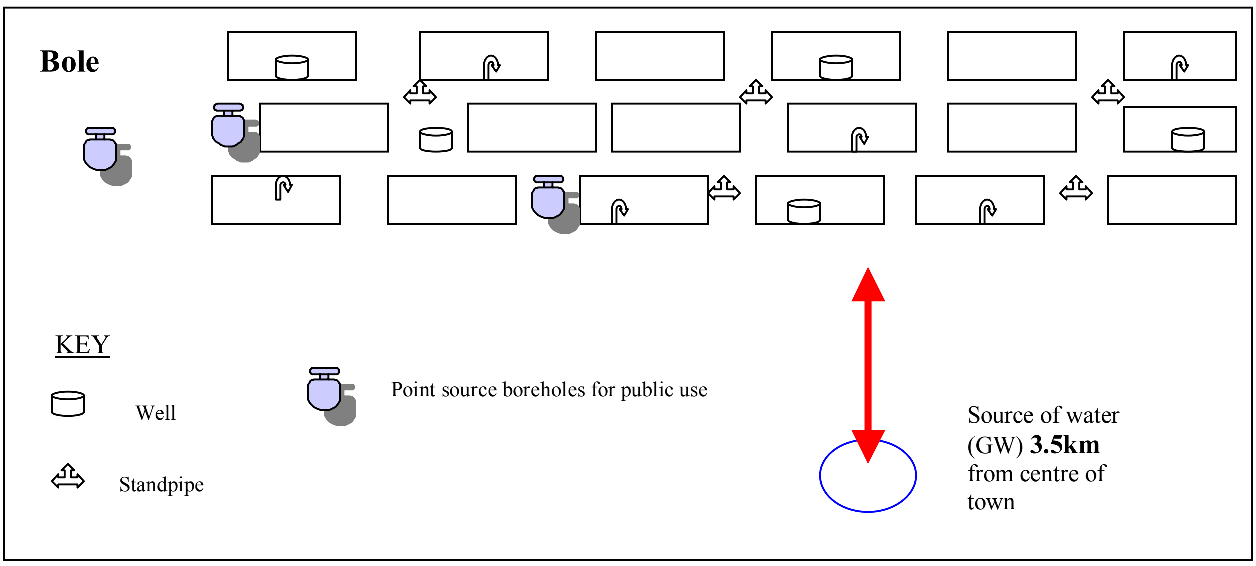

Figure 4.3 Schematic Diagram of Bole

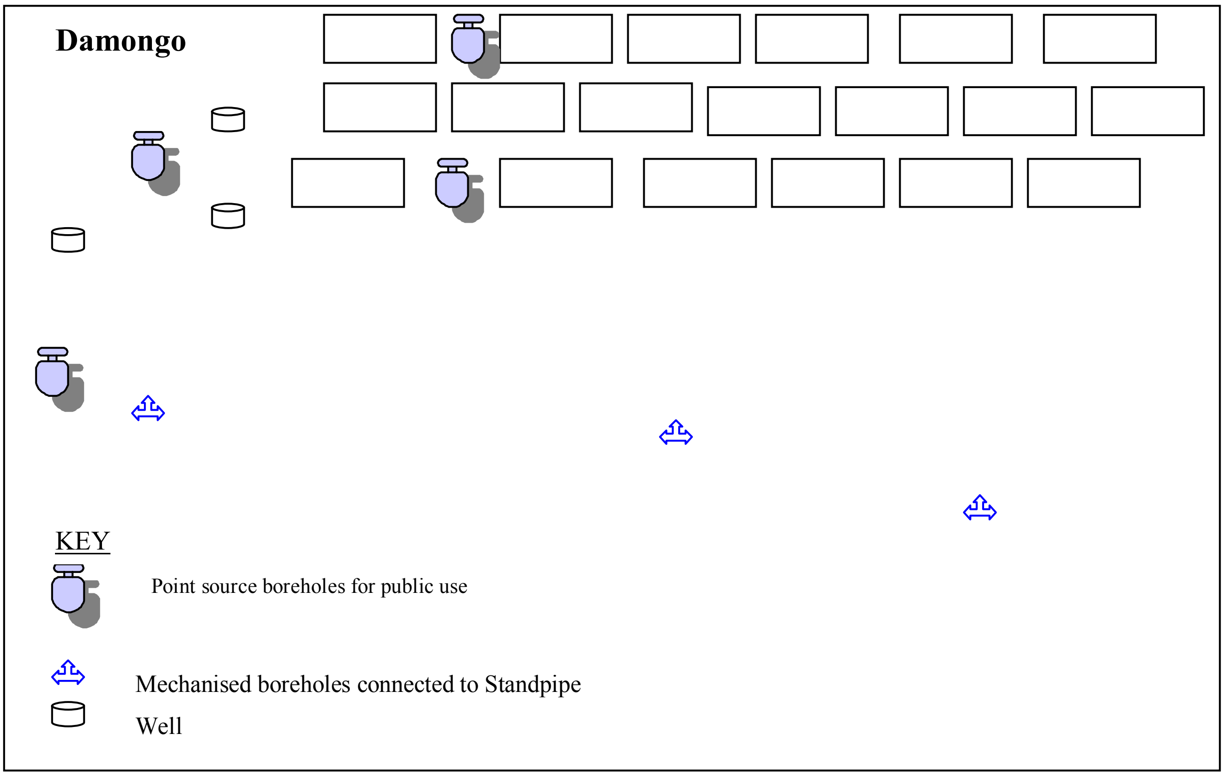

Figure 4.4 Schematic Diagram of Damongo

The three towns under investigation, though their water supply systems are all community managed systems, operate under different contexts that influence their overall performance, including: the age of the system, size of system, source of raw water, income levels of customers, annual rainfall in the area and alternative sources of water as detailed in Table 4.1 and illustrated in Figures 4.1, 4.2, 4.3 and 4.4 above. It should be noted that all the schematic diagrams are not drawn to scale and positions of the various items are illustrative for the readers' quick understanding of the situation in the towns.

Table 4.1 Context information for the community managed water supply towns

Context Information		Asiakwa	Bole	Salaga	Damongo
*Projected population (2008)		10,030	10,376	21,000	18,153
*Population growth rate		2.1%	2.4%	2.2%	0.9%
Average household size		4.7 (0.413) (1 – 9)	10.7 (1.395) (5 – 21)[3]	9.5 (0.914) (3 – 26)[1]	7.9 (0.71) (4 – 17)
Average per capita income (US$/annum)		$551.29 (197.24) (12 – 4038)	$292.78 (82.90) (20 – 1200)	$383.41 (79.21) (13 – 1700)	$343.6 (79.69) (2.68 – 1289)
Number of household connections	2005 2006 2007	53 60 76	189 222 263	330 436 553	0 0 0
Number of stand pipes	2005 2006 2007	19 19 19	30 30 30	16 0 0	24 48 48
Source of raw water used by operators		GW	GW	SW	GW
Topography		Undulating	Fairly flat	Fairly flat	Fairly flat
**Average annual Rainfall (mm)		1,500	1,100	1,275	1,144
Year of commencement of project		2003	1996	2000	2005

The figures in parenthesis represent the standard error of the mean and the minimum and maximum figures recorded. *Source: 2000 Population and housing census. ** Source: http://ghanadistricts.com (accessed 26/03/09). Note: GW = Ground water and SW = Surface Water.

In Salaga, where surface water is the source of the raw water, a treatment plant was built and chemicals have to be purchased continuously for treating the water, thereby adding to both the investment and recurrent operational expenses of the Salaga system. Any comparison of the financial performance of the Salaga, Asiakwa, Damongo and Bole systems must be viewed within the context that Asiakwa, Damongo and Bole systems rely on groundwater sources which do not require extra treatment.

The water supply systems in Bole and Salaga were projects of the Ghana Assistance Project (GAP), a Canadian International Development Agency (CIDA) sponsored project in Ghana, which had a different implementation strategy from the European Union (EU) funded Asiakwa water system. The GAP water projects implemented in the north were the first 'small towns water supply projects' in Ghana. All subsequent interventions, such as the EU projects, learnt from the GAP experiences, therefore avoiding the implementation lapses of the GAP projects. The Asiakwa project therefore benefited from lessons from Bole and Salaga. The current Damongo water system is an

[3]The large maximum figures are because some household heads teach the Qur'an and the pupils live with them till their completion and this could take several years and also because polygamy is part of the culture of the people in the towns.

emergency system provided by the EU which relies on a limited pipe network system, where boreholes are mechanised and connected to an overhead tank as shown in Figure 7.3. The emergency water supply scheme became necessary when the water system, rehabilitated in 1996 at a total cost of CD$ 753,012.43 (USD PPP$913,404.08) (GWCL, 2000), could no longer supply water to the town because of the drying up of the water source between 2004 and 2005.

By regional averages, per capita income for the Northern Region where Bole, Damongo and Salaga are located is US$322 and that of the Eastern Region where Asiakwa is located is US$412 (GSS, 2008). These average incomes compared with the fieldwork data captured in Table 4.1 show some similarity and therefore can be relied upon. GPRS I & II classify the three northern regions of Ghana as the poorest in the country (NDPC, 2005).

The climatic condition of the northern region is described as 'Guinea Savannah' with one rainy season and a prolonged dry season, while the eastern region is considered 'Deciduous Forest' with two rainy seasons and a shorter dry season (He et al., 2007). The rainfall regime affects the availability of water to consumers in the alternative sources. In each of the four towns there are multiple alternative sources of water which are free for use by consumers. These include streams, tanks and wells. As one example, historically, Salaga was a slave market during the transatlantic slave trade and every house had a well to store water for cleaning their slaves before taking them to the market square. Till today every house still has a well in Salaga but this time storing water for only household use especially in the rainy season. The use of the wells during the rainy season has been attributed to the low revenues the system operator generates in the rainy season in Salaga as consumers deny using the tap water.

In this chapter and in all subsequent ones, household connections refer to both single house (yard) taps and plumbed household connections. In general most dwellings in small towns in Ghana are compound houses which contain multiple households as shown by the household data in Chapter Seven with a higher than the national average of 1.7 households per house (GSS, 2008). In these compound houses a single tap typically serves all the residents of the various households.

Bole, Damongo and Salaga are the administrative capitals of their District Assemblies and are therefore the most economically vibrant towns in the districts as they act as service centres for the surrounding rural communities (Hinderink and Titus, 2002). Asiakwa on the other hand is not a district capital but is located 16 km from the district capital and on the major highway passing through that capital.

On governance of the management models, Asiakwa, Bole and Salaga whose water systems are implemented through the NCWSP and whose guidelines were discussed in Chapter One, were supposed to be similar in their operations but the research found that this is not the case. The District Assembly managed model in Damongo on the other hand is not being implemented through the NCWSP and therefore does have a WSDB in the town.

In Asiakwa, the DWST, who were supposed to oversee and monitor the operations of the water system on behalf of the District Assembly, indicated they did not know about what was going on in the town regarding their water supply, based on key-informant interviews. A number of reasons could be ascribed to this situation. All the members who are based in the District capital are new in the District as the old ones who received training were all transferred to other districts by their Regional Managers. In Bole the situation is an improvement over the case of Asiakwa as the DWST are based in the town and can easily be contacted but almost all the time are focused on the water supply in the rural communities. They believe that the WSDB is experienced enough to manage the systems without any supervision. In Salaga though the DWST is in the same town they play virtually no role in the water supply delivery and do not seem to know how the operators are performing. In these three small towns monitoring and supervision of the operations of the water systems by the DWST appear therefore to be very weak but in Asiakwa the consultants who supervised the construction are those that are in charge of monitoring and supervision an arrangement that is outside the NCWSP strategy. In Bole the District Assembly in 2006 begun to show increased interest in the water supply situation and that is in the right direction but, instead of the executive arm of the assembly directly doing the work, the DWST which represents the District Assembly should have been supported to perform that duty. The operations of the District Assembly managed model in Damongo are carried out by the DWST with no monitoring and supervision from the District Assembly. However, of significant importance, the maintenance of the systems is still being supervised by the EU consultants who were responsible during construction.

In terms of tariff setting, operators in all three towns under the NCWSP were expected to consult the communities in the process and the levels presented to the District Assembly for approval in line with the guideline and as captured in Table 1.3. However none of the operators consulted their communities in setting tariffs. On a single occasion the operator in Asiakwa presented their revised tariff to the District Assembly for approval but the other two towns have never presented their tariffs for approval. The operator in Damongo has not set their own tariff yet as the current one is that set by the consultants at the completion of the water project.

In line with the NCWSP guidelines the three community-managed water systems were to present operational reports twice a year to the communities as shown in Table 1.3 but in Salaga no such meetings or any kind are held with the community. In Asiakwa meetings are called only when it is necessary to pass some specific information such as interruptions to the people and not as required and in Bole only in 2006 that there was the need for a meeting as discussed further in the chapter. No meetings are organised in the community by the operator in Damongo.

On reporting of performance, in Asiakwa the consultants prepared a form for the operator to fill in all financial and operational data on daily basis in each month. These are available on files, with similar forms used in Bole but in this case prepared by the CWSA. The operator in Salaga does not follow any format in presenting performance reports but their daily operational records are kept on plain A4 sheets and receipts and bank records are retained. The operator in Damongo keeps proper records of their bank records and receipts of all expenditures and the vendors have daily recording note books for water sales and volumes of water pumped and sold. The operator in Asiakwa sends biannual reports to the Regional office of the CWSA in Koforidua (Eastern Regional Capital) by the supervision of the consultants. Bole and Salaga were also required to report their performances biannually to the CWSA regional office in Tamale (Northern Regional Capital) but this has not been done in any of the three years being investigated. The CWSA has been mentioned as requesting for the reports in both Bole and Salaga but they do not submit such reports.

The chapter, focused upon the supply side, institutional approach to service delivery, is organised according to the following three sections:

- Section 4.2 presents the quality of service delivered by the service providers
- Section 4.3 presents the economic and financial performance of the service providers
- Section 4.4 presents the human resources and the organisation which include subjective capacity descriptors based on the author's observations.

The investigations of service provider effectiveness and efficiency, with respect to the different management models, have included a review of the data over a three year period, to determine whether there are any observable trends in performance from any particular management model and to attempt to eliminate the effect of any 'bad' years where performance could have been unduly influenced by particular events such as droughts or floods, elections or recessions, breakdowns or sudden price increases.

4.2 Level of services provided by operators

The level of services indicators assessed in this section include service coverage, water availability in a day, per capita water supplied to households referred to here as per capita water consumption and breakdown times in a year. Any limitations in services delivered, described by these indicators, have the potential to encourage households to make yet more use of the alternative sources of water. Section 4.2 is therefore seeking to fulfil the sub objective of determining the level of service provided to consumers in small towns by local service providers, considering overall effectiveness and equity in access by different groups of consumers. In this chapter and in chapter five and six the different groups consumers refer to house connection and standpipe users.

4.2.1 Service coverage

The service coverage indicator directly measures the effectiveness of service delivered to consumers. To consider a provider as being effective by service coverage indicator, 100% of the towns' population is expected to be covered by the operator.

In three (except Damongo) out of the four towns customers are served with water through a mix of public standpipes and household connections. As shown in Table 4.1, year on year additions are made to household connections (plumbed household connections and house yard taps) but typically no additions are made to the public standpipes which had been designed originally to serve an average of 300 people per outlet (Fieldwork data). In Salaga the public standpipes were not functioning in 2006 and 2007 as shown in Table 4.1 above due to low pressure. In all the four towns the design number of 300 was used to determine the number of people likely to be served by the standpipes. The number of people served by household connection is calculated by multiplying the number of household connections by number of households per house and the average household size for the town. The research acknowledges that the use of the design estimate of 300 people per public standpipe has the tendency to over-estimate the coverage figures over time because as households connect water to their homes they do not resort to the standpipes any longer. These presumed coverage figures do not include the households who resort to their neighbours' supply pipes in the cases of Asiakwa, Bole and Salaga, as captured in Chapter Seven, and so the error generated by the use of 300 people per standpipe might not be that significant to affect the validity of these coverage figures. Figure 4.5 shows that in Asiakwa Bole majority of the population are served by the public standpipes and in Salaga in 2005 as the public standpipes were not in use in 2006 and 2007. In Damongo there are no house connections. The standpipes problem in Salaga persisted because the community operator could not raise the equivalent of US$10,870 directly from their revenues or from the District Assembly to rehabilitate their high lift tanks.

It is noticeable in Figure 4.5 that while the service coverage by household connections recorded some increases between 2005 and 2007, the stand pipes recorded decline in coverage within the same period, except for Damongo, between 2005 and 2006. In 2005 Damongo was relying on four mechanised boreholes with six outlets each and in 2006 the mechanised boreholes were doubled with each borehole having the same six outlets. For the three years Bole recorded total coverage figures, according to the design assumptions, of more than 100% indicating a potential capacity that could be utilised in future. However, even with these coverage figures, customers in Bole still complain of water shortages during the dry season and the irregular flows have been causing struggles between consumers at the standpipes whenever water is flowing. In Salaga, the operator believes their coverage figures are higher than the design figures because anytime water is flowing "people are seen moving across the town fetching water". The operator in Asiakwa however believes that their present coverage level is well within what their town requires as a lot of people move in and out of the town on a regular basis, either to their farms or for other economic activities. They also contend that because their system operates everyday they hardly have queues at their standpipes.

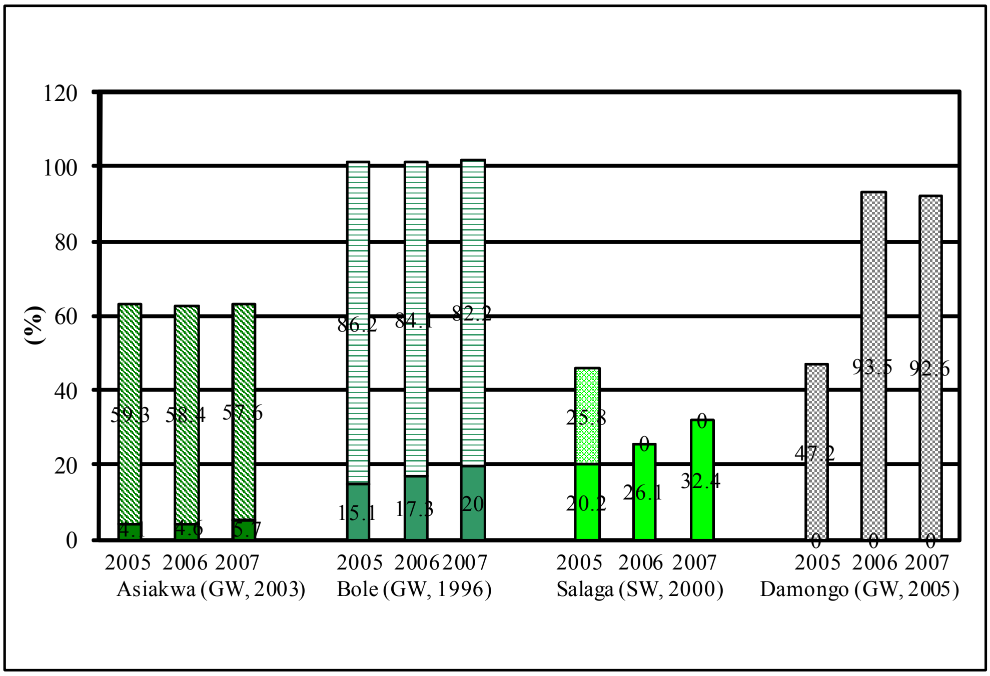

Figure 4.5 Percentage of population served by household and public standpipes

Note: In Salaga standpipes were not functioning in 2006 and 2007 and in Damongo there are no house connections. The lower charts in the other towns represent coverage by house connections and the upper charts represent coverage by the public standpipe.

4.2.2 Water availability

This indicator of water availability assesses the number of hours in a day that customers receive water supply from the systems and as Figure 4.5 above show different groups of consumers in terms of users of house connections and standpipes, this indicator provides information on equity of service. The water availability indicator has been calculated as a percentage of a 24 hour a day, though considering actual demand from standpipes it could be argued that 18 hours represents a more appropriate 'service day'. It should however be noted that the measurements shown in Figure 4.6 do not consider the breakdown times and therefore represents best performance for each of the towns.

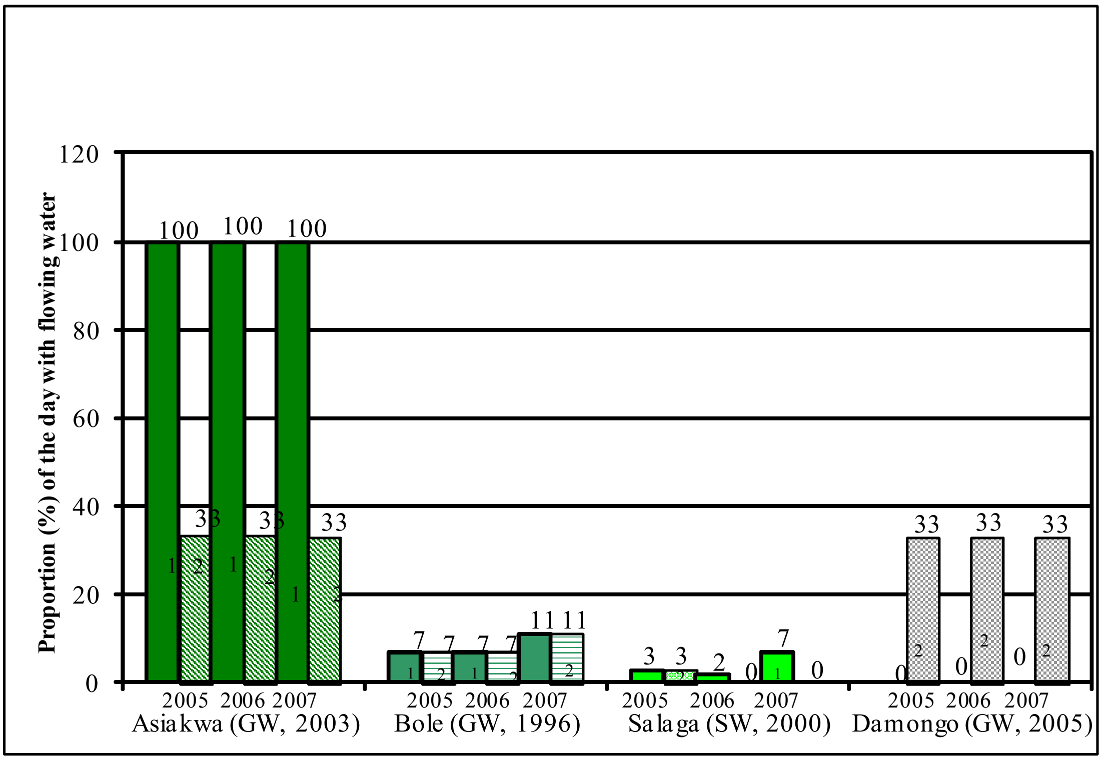

Figure 4.6 Average number of hours of water flow in a day

Note: 1 represents house connection and 2 represents standpipes.

In these towns, except those with house connections in Asiakwa, customers do not receive 24 hours continuous service. Those customers in Asiakwa who receive continuous service constitute less than 6% (from coverage estimates) of the population of Asiakwa, as shown in Figure 4.5 The customers in Asiakwa who depend on the public standpipes and constitute more than almost 60% (from coverage estimates) of the population experience only 8 hours of water flow a day. This is because the commissioned vendors who manage the standpipes work from 5:30 am to 10:00am and from 2:00 pm to 5:30 pm every day. In Bole customers received water for 5 hours every three days in 2005 and 2006 and this improved to 8 hours a day every three days in 2007. The times water flows in Bole has been of concern to consumers as they claim that sometimes the taps start flowing at about 2:00am when they are all still asleep. The level of improvement in the hours of flow in 2007 was due to the increased interest in the water supply situation by the Bole District Assembly and also the increasing agitation within the population for a change of operator because of the perceived poor performance. Box 4.1 contains what the Director of a civil society organisation in Bole, the Civic Union had to say about their role in 2006.

Box 4.1
"We got involved in the Bole water issues in the latter part of 2006 when a breakdown of the system had gone past one month and the community members were planning a demonstration against the Water Board. The community believed that it was the lack of maintenance of the systems that caused the frequent breakdowns. Three days to the scheduled demonstration, we realised the Water Board was not doing anything to stop it and we approached them to organise community meeting but they did not have money and we had to sponsor the meeting with support from our donors, GAIT (Government Accountability Improves Trust)".

According to the Civic Union they helped the Water Board obtain approval for a 100% increase in tariffs from consumers and managed to get the District Assembly to advance an interest free loan for the immediate repair of the systems. They got the community to accept that whoever was in arrears of bills payment would be disconnected and any reconnection would automatically attract a meter. The role of the Civic Union in Bole points to the significant contribution some civil society organisations could play in small towns water supply in Ghana.

In Salaga water supply is rationed among seven blocks and each block receives water once a week. In 2005 each block was further divided into two sections and water was supplied for 10 hours to the two sections a week and in 2006 the number of hours reduced to 8 but this time each block comprised three sections. The situation improved marginally in 2007 where hours of flow were increased to 12 per block of one section. The reasons given for this level of water availability were that in 2005 one of the two pumps at the intake broke down and could not be repaired and this situation was aggravated by excessively leaking high lift tank in 2006 resulting in water being pumped directly to customers. The repair of the second intake pump improved services in 2007. During interaction with a section of the consumers in Salaga they indicated by their understanding they should have been receiving four hours of water flow per week but what they get is less than two hours per week.

In Damongo, all vendors work for 8 hours in a day and this is the only period when consumers have access to water from the improved system.

Despite Asiakwa water system providing on the average longer hours of water flow to their consumers relative to the other three towns, the hours of flow are not equitable as shown by the daily hours of flow for house connection users and standpipe users. On the other hand the operators in Bole and Salaga, although they provide water at relatively fewer hours per day, both house connection and standpipe users receive the water the same hours of flow in a day, making their services more equitable.

4.2.3 Water consumption

A basic water supply service is defined as one that provides protected all year round supply of 20 litres per capita per day (World Bank, 1994; IBNET, 2009; WHO and UNICEF, 2000). CWSA defines a basic water supply service as one that provides 20 litres per capita per day for standpipe users and 60 litres per capita per day for those with household connections (CWSA, 2004a).

In all four small towns, as the majority of the people rely on the public standpipes as their source of water from the formal systems, a minimum of 20 litres per capita per day is used as the lower limit for this analysis from the supply side perspective and it provides another measure of how effective the operators are providing water to meet this basic consumption. The minimum 20 litres per capita consumption is adopted also because the data available to this research could not be used to segregate the consumptions based on the different user groups. In Chapter Seven, the actual per capita water consumption (consumption from all sources) reported by households (different user groups) in each of the towns is presented.

Figure 4.7 compares the per capita water consumption per day of Asiakwa, Bole, Damongo and Salaga to the basic consumption. The per capita water consumption values were estimated from the annual water reportedly sold by each operator. From these figures it appears that none of these systems is able to supply the 20 litres/person/day required for a basic service where customers use public stand pipes. There is however no indication of operators producing more water above this consumption level after accounting for the unaccounted for water. However, Salaga the best performing operator among the four is providing per capita consumption of about 14litres/day but showing no trend of performance, Bole is showing per capita consumption of about 10litres/day with a declining trend possibly attributable to increased rate of coverage than increased rate of the water distributed.

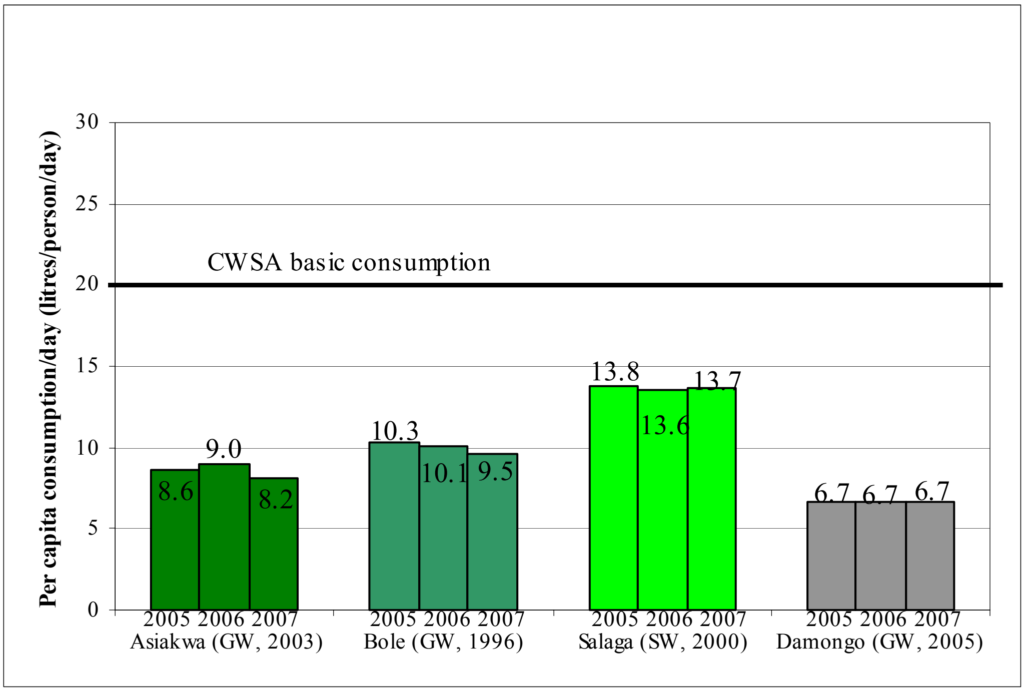

Figure 4.7 Per capita water consumption based on annual water sold by operators

4.2.4 Breakdown time

Breakdown time, which particularly from a consumer's point of view is a very important measure of the service quality and is one measure of the effectiveness of the operator, is measured as days in the year that the system breaks down, therefore showing annual interruptions to the flow of water to the customer. The breakdown time is largely caused by technical failures and shows the swiftness with which faults are resolved. The breakdown time is also a function of the availability of funds to pay for the repairs and the availability of mechanics to be hired. Higher breakdown times reduce the quality of services of operators who even record higher coverage and daily water availability indicators and therefore an important indicator in assessing the effectiveness of operators' services. In Figure 4.8 the breakdown time is represented as a percentage of the year that there were no operations of the water supply system. The CWSA measure of a reliable water supply service is one which records breakdown time of not more than 5% of all the days in a year (CWSA, 2004b).

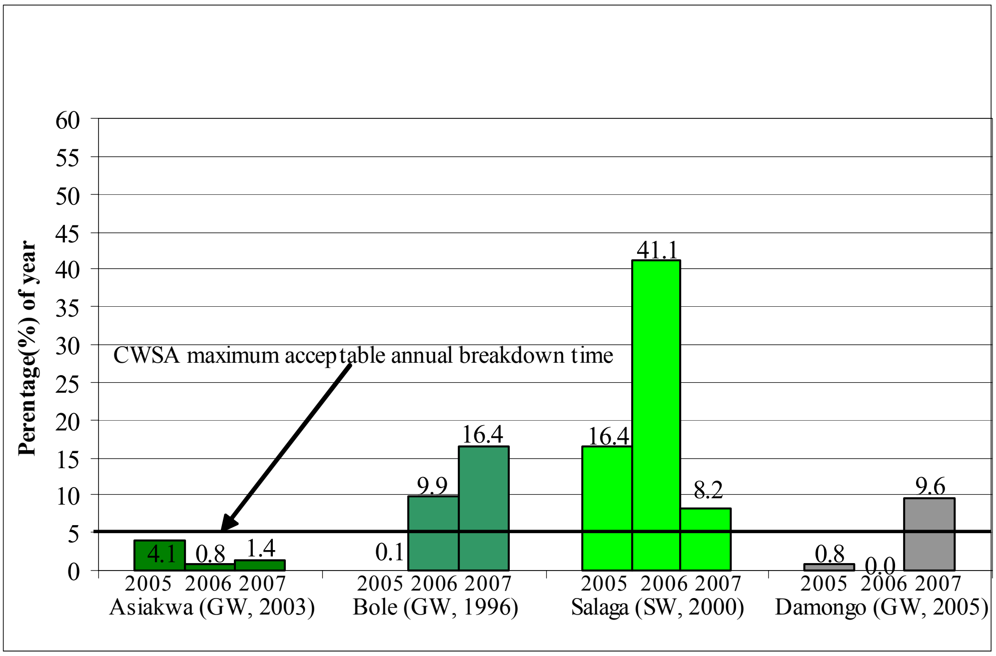

Figure 4.8 Percentage of year water supply system is inoperative

The impressive reliability level shown by the Asiakwa and Damongo (2005 and 2006) water systems should be judged against the fact that they are the newest among the four systems. As shown in Table 4.1, Bole water project commenced operations in 1996 while Salaga came on board in 2000, Asiakwa in 2003 and Damongo in 2005. In 2007 the Damongo system experienced series of electrical problems on their control panels resulting in the increase in the breakdown time. The main contributors to the breakdowns in Bole have been the frequent breakdown of the electric pumps and the control panel and the situation worsened between 2005 and 2007. In 2007 all towns suffered from the national electricity crisis caused by low water levels in the hydro electric dam in Akosombo. The water supply system in Salaga recorded more than double the 2005 breakdown time in 2006 because the broken down intake pumps could not be accessed because of floods in the area caused by heavy rains. This however improved in 2007, following their repair. The consumers in Salaga experienced an acute water situation in 2006 and this was the year where the town experienced the least water availability as shown in Figure 4.6 above. The situation of 2006 was also highlighted during the consumer interviews in 2007 in the town.

The impressive reliability figures in Asiakwa and Damongo in addition to their relative newness are attributable to the fact that the contractors who constructed the systems were still responsible for the maintenance of the water system as at 2007. The contractors live in the national capital, Accra, a distance of about 100km from Asiakwa with a first class road linking them and for the Damongo system the contractor has an agent in Tamale 122 km away. The mechanics that service the Bole water system are hired either from Tamale (220 km) or Wa (96 km) or Techiman (250 km). The nature of roads between Bole and Tamale and between Bole and Techiman are disincentives to getting mechanics to Bole from the two centres. Salaga, on the other hand, uses mechanics from GWCL in Tamale 120 km away, with the lack of funds always being the limiting factor. While Bole, Damongo and Asiakwa have electrical problems as their major faults that cause breakdowns, Salaga has in addition a treatment plant to contend with.

4.3 Economic and financial performance

This section forms part of the investigation leading to the sub objective of this research that seeks to determine the financial sustainability of small towns water supply by the analysis of the financial performance of operators. As discussed in sections 4.2 above, the breakdowns and water availability have been influenced in one way or the other by lack of resources for repairs. The performance indicators presented in this section are, water tariffs, bill collection, operating expenses versus operating revenues, revenue/person, and investment/person. It looks first at revenue losses through water losses, metered connections and tariff setting which are equally important in discussing the finances of the water operators.

Analysis of metered connections is critical in this section as metering customers is the most appropriate way of charging customers for their water consumption in a partially served system. Therefore in discussing water tariffs, metering must be considered along side. Water losses also represent revenue losses and so this indicator is also vital when discussing the economic and financial well being of any water supply system.

Three efficiency indicators, unaccounted for water, bill collection efficiency and metered connections have been included in this financial performance section as a means of expressing their importance to the financial well being of the operators.

4.3.1 Revenue losses through water losses

Water losses through the system represent the inefficient use of the water resources and it also represents revenue lost to the operator. It is therefore an efficiency measure and will be considered as such in our subsequent discussion chapter.

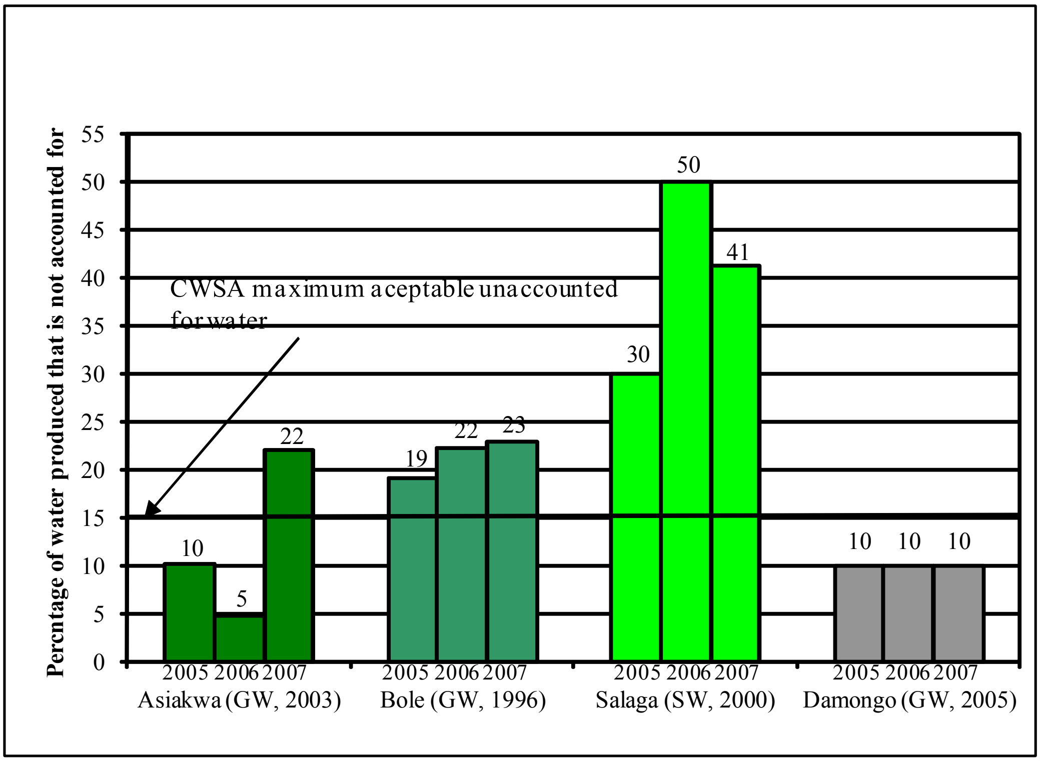

Figure 4.9 Percentage of unaccounted for water

The CWSA considers unaccounted for water of not more than 15% as a measure of water resource sustainability (CWSA, 2004b) which also represents environmental sustainability measure. Unaccounted for water also represent revenue loss to the operator and therefore higher unaccounted for water impacts negatively on the revenue levels of operators which ultimately affect financial sustainability indicators. In order that operators improve their revenues, there is the need to target lower unaccounted for water figures. Figure 4.9 above compares the reported unaccounted for water for Asiakwa, Bole, Damongo and Salaga in 2005, 2006 and 2007.

In 2005 and 2006, Asiakwa recorded a level of unaccounted for water below the CWSA recommended maximum figure of 15% but this good performance could not be maintained in 2007 due to frequent pipe bursts causing an unaccounted for water record of above 20%. The operator has no explanation for the deterioration in performance. In Damongo each vendor is allowed 10% unaccounted for water and that provides an incentive to the vendors to control water losses as any losses beyond the 10% is calculated in monetary terms and deducted from the vendors allowance (income). Salaga in all three years performed poorly in terms of this indicator. This poor performance by Salaga was due to the uncontrolled manner in which shallow dugouts called 'down belows' ('pit taps' in other countries) were created by consumers to access water, as shown in Figure 4.10 below. Households also cover these 'down belows' indicating they did not receive water which, as the operator was unable to verify, led to the poor estimated consumption figures and hence loss of revenue to the operator. The 'down belows' were necessitated by low pressures in the pipes which could not support the pressure heads required by the house pipes. This situation persisted because the system operators could not raise the equivalent of US$10,870 to pay the invoice received from GWCL for the rehabilitation of the high lift tank as discussed earlier in the chapter.

Figure 4.10 A typical 'down below' water access point in Salaga

Source: Braimah, C. A. (2007)

4.3.2 Metered connections and tariff setting

In order that system operators develop tariffs based on consumption, customers' water uses need to be metered and the meters functioning properly. Metering customers is a management tool that operators adopt to improve upon their services (IBNET, 2009) and every system operator should aspire to achieve 100% metering. Consumption estimates that are not based on meter readings are not usually fair; either customers are overcharged or undercharged for water use. In both cases the financial sustainability of operations of the service provider are in question. Lower tariffs means revenues are unlikely to cover operational costs and higher tariffs mean water is more expensive which affects demand. The Finance/Administrative officer of the Salaga Water system found out how inappropriate their tariff settings had been when he was attending a training programme, and his comments are captured in Box 4.2 below.

Box 4.2
"During our training in budgeting and tariff setting at the Kwame Nkrumah University of Science and Technology in Kumasi I realised all along we were not doing the right thing in setting our water tariff as we charging for water not based on consumption of customers since we do not use meters so I stopped the facilitator and told him I am sure the training was not meant for us in Salaga because we do not use meters".

The operator in Salaga loses revenue during rainy season the result of not metering customers. During the rainy season, households according to the operator, always tell their revenue collectors they depend only on their house wells and so did not use the tap water and as they do not have any way of verifying the consumers claims, they walk away anytime. The reasons assigned for not able to meter customers according to the operator is due to lack of resources to purchase meters and the District Assembly which usually support them financially is not interested in their acquisition of the meters.

In Asiakwa a meter and its accessories are provided at the time of connection with the cost built into the connection fees. This has resulted in the record 100% metering in all three years because there cannot be any new connections without a meter. There are no available records on the percentage of meters now working but the operator believes that all meters continue to work.

Meters are provided and connected to each mechanised borehole connected to the overhead tanks during construction in Damongo. The 100% metering recorded in Damongo therefore is not attributable to the efforts of the operator.
The increased interest by the Bole District Assembly in the water supply system in 2006 and by the provision of the interest free loan to the water supply provider has ensured that the operator took metering seriously in 2007. This success was because in providing the loan a condition that if the loan was not repaid in six months the Water Board, which operates the water system, would be dissolved, provided the incentive. Though the threat of dismissal and dissolution of operators and the Water Board smack of interference, it was the only way, according to the District Coordinating Director (personal communication, 2007) to get the operator to improve their revenues. This means that improved services may be achieved in small towns water supply if there are mechanisms in place for close monitoring. The operator in Bole has recorded continuous improvement in the performance of metering in the three years under study.

In contrast to the operator in Bole the operator in Salaga has no incentive to increase revenues as the East Gonja District Assembly provides grants to meet their operational expenses and hence not metering customers have not been considered in any year. The picture shown in Figure 4.12 below captures a widespread customer behaviour in Salaga as wells are found in almost every house, as discussed.

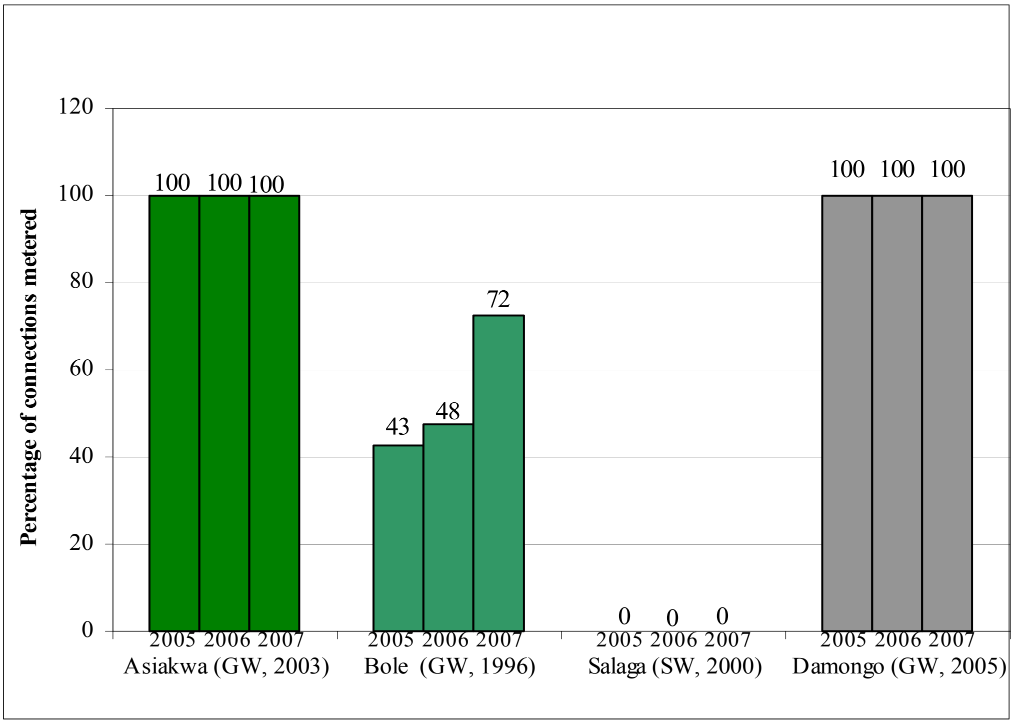

Figure 4.11 Percentage of connections with operational meters

Figure 4.12 Unmetered house yard tap arranged to discharge to an unlined well in Salaga

Source: Bakari, S. S. (2009)

4.3.3 Water tariff

The water tariff is one of the most important sources of funds for water supply systems in small towns in Ghana and charging an inappropriate tariff has the potential to starve the system of its life blood. Lower tariffs results in low revenues which ultimately affect the managerial efficiency of the systems. On the other hand higher tariffs result in alternative sources becoming cheaper and therefore lowering the demand for water from the system – price elasticity is particularly significant when alternatives are so readily available. It is therefore important that tariffs are set at a compromise between these issues but there remains the requirement of an adequate revenue flow. Figure 4.13 below shows a plot of average revenue/m^3 against full supply cost/m^3 for Asiakwa, Bole, Damongo and Salaga in 2005, 2006 and 2007. The average revenue has been calculated as the ratio of the total annual water sales to the annual volume of water sold. The supply cost has been calculated as the ratio of the sum of the annual operational costs plus annual depreciation relative to the annual volume of water sold. The calculation of the supply cost in small towns in Ghana does not include any cost of capital, that is the loan and interest payments normally required because investments are subsidised (given) to small towns to not less than 95% with the remaining 5% contributed at the inception of the project by the beneficiaries. However the research has not used operating expenditures only as is common in many other analyses because of the capital maintenance sustainability challenge referred to in Chapter Two. The Government of Ghana finds it as difficult to provide funds for capital maintenance as any other government – hence the ideal tariffs should be able to deliver those resources over time. Any operator whose unit average tariff equal the unit full supply cost is said to be charging cost reflective tariff necessary for financial sustainability of the water system.

In calculating depreciation of the water supply systems in small towns two different approaches exist in Ghana. The CWSA estimation of the life of their water systems is a very modest 10 years while GWCL adopts a more conventional 20 year life - this research has adopted a 20 year life in the calculation of all indicative depreciation costs. The argument for using a 20 year life in this research is because that provides for a longer time for system renewal and hence a relatively lesser supply cost annually for small towns which we are told are inhabited by the poorest segment of the Ghanaian population (World Bank, 1994; NDPC, 2005). More pertinently a relatively well-managed system should be able to achieve a reasonable 20 year life. However, additional research will be required in time to determine the actual asset lives achieved so as to verify this assumption. Figure 4.13 below shows that, even at the level of supply cost provided by 20 year life of the systems, the average tariffs recorded are below the supply cost.

Figure 4.13 indicates that none of the four towns is charging anything like a full supply cost and therefore the long term sustainability of these systems cannot be guaranteed if the water supply systems are to depend solely on their water sales. While all three systems fail to charge sustainable tariffs their levels vary. In Asiakwa for 2005, 2006 and 2007 the average tariffs represent respectively 72%, 57% and 68% of the supply cost and these levels of tariffs reflecting the increasing trend in the supply cost. These average tariffs in Asiakwa are significantly higher than the levels required for the supply cost in Bole. At the relatively lower supply cost in Bole, the average tariffs charged in 2005, 2006 and 2007 were 45%, 32% and 73% of the supply costs but this situation is not surprising. In addition to the internal challenges militating against charging higher tariffs in all the towns, Table 4.1 show that relatively, customers' per capita incomes are higher in Asiakwa than in Bole, Damongo and Salaga. In Damongo the average tariffs charged in 2005, 2006 and 2007 represented respectively less than 63%, less than 20% and less than 19% of the full supply costs. The continuous decline in the ratio of average tariff to full supply cost in Damongo was due to the operators not reviewing their tariffs when the new investments were made in 2006 and 2007 in addition to the depreciation of the local currency against the US dollar in which the investments were made. Salaga with its own challenges described earlier merely recovered 10%, 6% and 5% of the supply cost in the form of average tariffs in 2005, 2006 and 2007 respectively.

None of the four small towns operators have devised a formula to calculate tariffs and volumetric charges are fixed arbitrarily. This could possible change when the CWSA guidelines become operational. Salaga has a more liberal approach where a flat rate is charged per house anytime water flows, irrespective of the number of people or containers used to store water in the house.

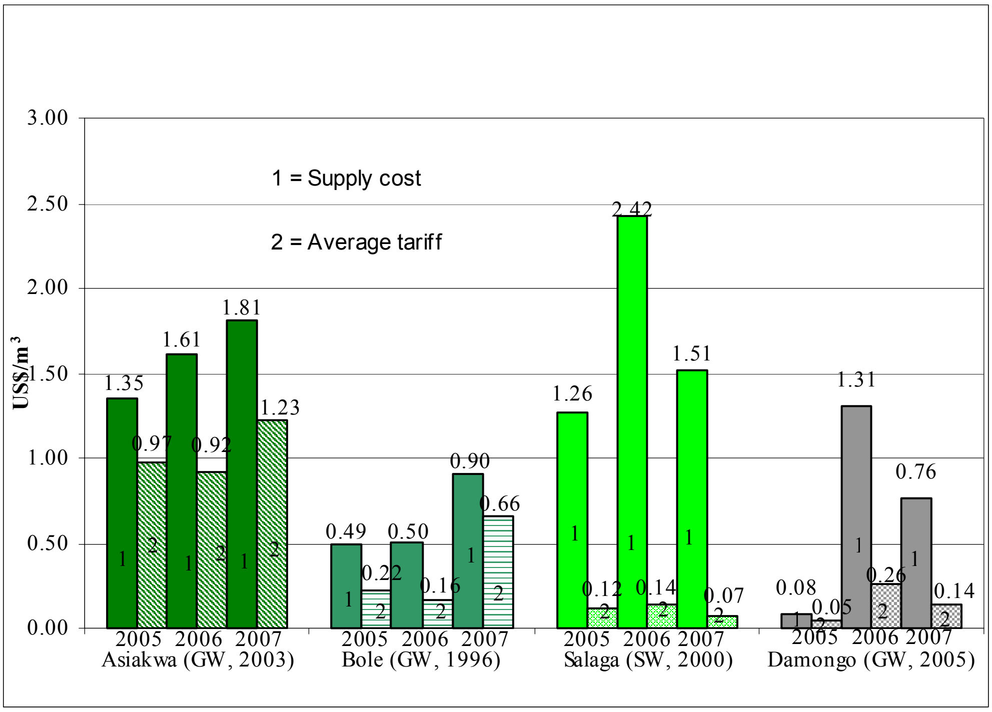

Figure 4.13 Average tariff against calculated cost of supplying water

The subsidised financing arrangement in small towns water supply in Ghana does not require the payment of either interest or capital amortisation by operators or customers. It is the policy under the demand driven approach of the Community Water and Sanitation Programme (CWSP) in Ghana that communities will be responsible for all operation, maintenance and minor repairs plus long-term capital maintenance of their system when they are provided with the facility. It is therefore required that revenues generated should be enough to cater for all of these elements.

The ‘operating ratio' generally used in water utilities as a measure of financial viability of the water system is the ratio of operating expenses to operating revenues. Conventionally a ratio of around 60% is considered reasonable, taking into account the need to finance depreciation and the cost of capital in addition to operating expenses (anything below 100% indicating that at least operating expenses are fully covered). The CWSA considers acceptable a ratio equal to or less than 100% but this presumably has been defined to include depreciation as part of the operating expenses. However in this research the conventional approach in determining operating ratios where depreciation is excluded is adopted and therefore the operating ratio here represent financial sustainability limited to operating expenses and operating revenues.

Figure 4.14 below shows that Asiakwa and Damongo over the three years are the only towns able to generate sufficient revenue to match the operating expenses in line with the CWSA benchmark. The impressive performance of Damongo and Asiakwa water systems must be again assessed in the context of the two systems being relatively new.

The frequent breakdowns of the Bole system which resulted in agitations amongst the consumers and the subsequent repairs are showing in the increasing trend of the operating ratio over the three consecutive years. In Salaga, the water supply system recorded unacceptably high operating ratios in 2005 and more so in 2006. As a result of an almost 600% increase in water tariffs in 2007 as shown in, Figure 4.15 the high operating ratio of 4.93 in 2006 was reduced to 1.94 in 2007. The high breakdown time recorded in Salaga in 2006 in Figure 4.8 which reflected again in the full supply cost in Figure 4.13 has reflected again in Figure 4.14 below.

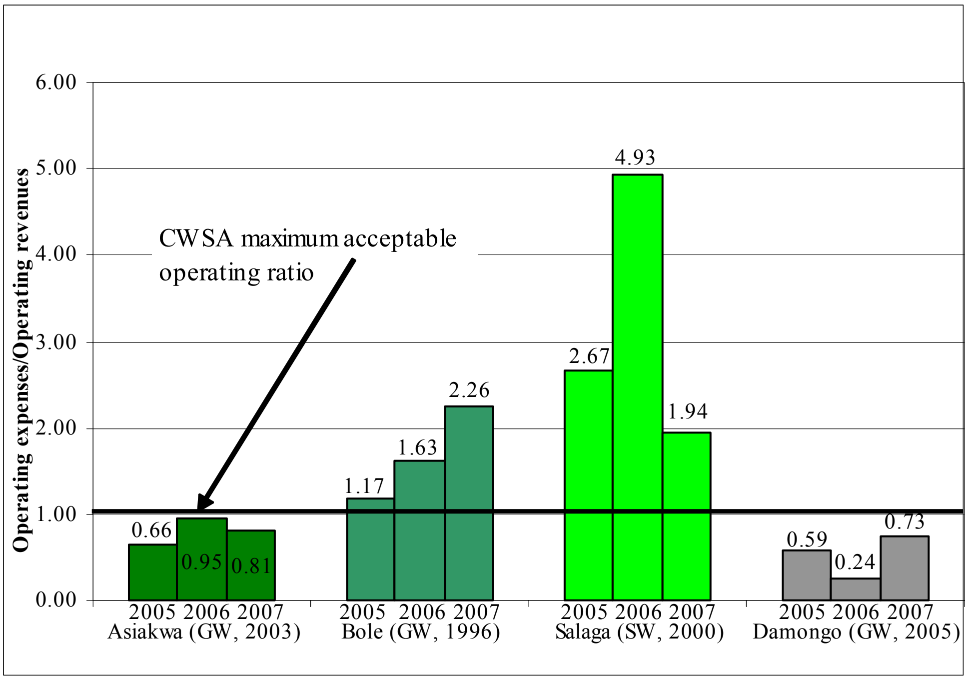

Figure 4.14 Operating ratios of Asiakwa, Bole, Salaga and Damongo

In Bole and Salaga, the District Assemblies have financially supported their water supply systems to meet the gap between their operating expenditure and operating revenue. The operator in Bole in December 2006 received an interest free loan equivalent to more than 110% of the revenue generated in 2006. The operator in Salaga similarly receives grants from the District Assembly every year, in increasing magnitude to date, to meet their operating expenses. For example in 2005 the operator received a total amount equivalent to 33.5% of the 2005 revenue, received in 2006, grants equivalent to 206.8% of the revenue in 2006 and in 2007 received more than 209% of the revenue in 2007. The revenue challenge confronting these small towns water systems are not entirely due to management deficiencies on the part of the operators. Operators, CWSA, WSDB and DISCAP have all complained about the lack of payment of the water bills for government institutions by the central government. These institutions, the schools, hospitals, police have been reported by operators as consuming up to 50% of the water distributed. The government therefore holds the key in ensuring that these small towns water operators are able to manage their systems sustainably.

At the inception of any small towns water project (except the Damongo system) in Ghana two accounts are opened at the bank, one to cater for recurrent expenditure and the other is a depreciation/capital replacement account where funds are deposited for capital maintenance of the systems. As at 2007 only one bank account (current accounts) was operated by the Damongo system as its implementation was not in line with the NCWSP. The accumulated funds in the replacement accounts are additional evidence that point to the management capability of community managed small towns water supply systems and a measure of long term financial sustainability.

Table 4.2 Accumulated funds in the Depreciation/Replacement Accounts of Asiakwa, Bole and Salaga water systems

Town	**Year of commencement of water project**	**Accumulated funds (US$) as at 31st Dec. 2005**	**Estimated accumulated depreciation (US$) 2005**	**Accumulated funds (US$) as at 31st Dec. 2006**	**Estimated accumulated depreciation (US$) 2006**	**Accumulated funds (US$) as at 31st Dec. 2007**	**Estimated accumulated depreciation (US$) 2007**
Asiakwa	2003	13,670.29	40,971.30	12,564.72	55,661.05	17,572.62	70,992.33
Bole	1996	0	82,493.46	0	91,111.88	0	100,619.15
Salaga	2000	0	202,075.35	0	244,287.02	0	287,347.64
Damongo	2005	N/A	1,664	N/A	23,395.60	N/A	46,637.66

Source: Author's elaboration.

As Table 4.2 shows, Asiakwa is the only town which over the three years has had any money in their depreciation/replacement account and in 2005, 2006 and 2007 these amounts represent respectively 33%, 23% and 25% of the expected estimated accumulated depreciation funds. These figures show that despite the effort of the operator in Asiakwa to save some money for capital maintenance the level is low to be able to renew the water supply system. The adherence of running a live replacement account in Asiakwa is due to the strict enforcement by the consultant who still has responsibility for monitoring the water supply system. This oversight responsibility is non-existent in Salaga and Bole where the consultants have long been pulled out and which also points to the implementation differences of the donor agencies. As mentioned earlier in section 4.1, the Bole and Salaga systems were implemented through CIDA/GAP programmes while the system in Asiakwa was implemented by the EU. Table 4.2 shows that after the useful lives of all four water supply systems external support will have to be sought to renew the water systems in the towns.

The operation and maintenance guidelines of the CWSA small towns water policy provide the tariff setting principle that, "the unit rate of tariff for individuals and non-commercial institutions shall be between 120% and 130% of the normal tariff charged for standpipe customers" (CWSA, 2004b). This tariff ratio represents another measure of equity, a criterion of sustainability relating to the first objective of this research. The CWSA principle guiding the tariff charged at standpipes and at households is not being adhered to, as shown in Figure 4.15. In Bole standpipe customers paid 460%, 466% and 414% of the tariff customers with household connections paid in 2005, 2006 and 2007 respectively. In 2005 in Salaga when the standpipes were in operation, standpipe customers paid almost five times the charge customers with household connections paid per cubic metre of water. The situation in Bole and Salaga (2005) presents a critical situation where any tariff review should be done cautiously, not raising further the levels at the standpipes, since that will ultimately make alternative sources even more attractive. Asiakwa however came close in 2007 when the customers using household connections were charged approximately 117% of the tariff standpipe customers are paying but this does not represent equity of service delivery though. It should be recall that the Damongo system does not have house connections.

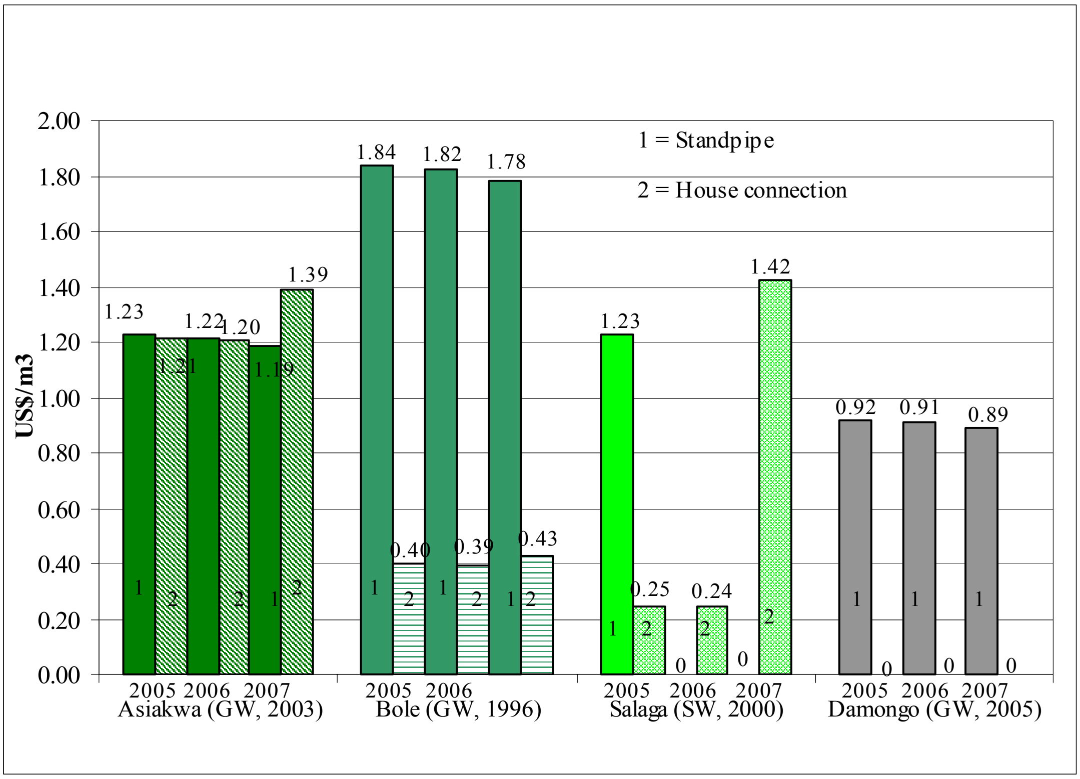

Figure 4.15 Actual tariff charged at standpipe and at household connections in US$/m^3

Citing another CWSA document on tariffs, (Nyarko, 2007) indicates that the water tariff in small towns, according to CWSA, should not exceed an equivalent of US$1.0/m^3 but this has been contradicted by the tariff levels shown in Figure 4.15 at all standpipes in three out of the four towns and at Asiakwa house connection in 2007. This shows how the particular challenges confronting small towns water supply operations are simplistically viewed by agencies involved in small towns water delivery in Ghana.

4.3.4 Bill collection

Cost reflective tariffs are a vital ingredient in the sustainability of water supply systems. However, if fewer customers pay their bills the impact is as severe as charging lower tariffs. Bill collection efficiency although it is an efficiency indicator is an important component in determining financial sustainability of water supply systems as it provides the insight about levels of unpaid bills of consumers. Tariff setting, billing and bill collection complement each other towards the financial well being of the water supply systems. Bill collection efficiency, which determines the percentage of the ratio of bills paid to bills sent out, is an important performance indicator as it describes directly the efficiency of the operator.

Asiakwa over the three years, as shown in Figure 4.16 below, recorded progressively, increasing collection efficiencies while Bole and Salaga showed mixed patterns, with Bole dropping in performance from 2005 to 2007. Salaga on the other hand increased their collection efficiency from 2005 to 2006 but it reduced again in 2007. These collection efficiencies of the operators include for Asiakwa and Bole 100% collection at the public standpipes where the principle of 'pay as you fetch' is being adopted.

The bill collection efficiency indicator recorded in the four towns should be viewed within the contexts within which they were achieved. In Asiakwa and Bole payment of bills are made by customers at the offices of the operators on monthly basis. In Salaga on the other hand, the operator does not have an office and so bill collectors, as they are called, move from house to house to collect the flat rate charge per house anytime water flows in any block. In Damongo where standpipes are the only source of water from the operator, the principle of 'pay as you fetch' mentioned is applied explaining why the operator has recorded 100% collection in all three years.
In the yet to be operationalised small towns policy (CWSA operation and maintenance guidelines), components of water tariff in small towns include "tariff collection expenses" which has been suggested, should not be more than 20% of the total tariff (CWSA, 2004b). This additional revenue to the operators could ensure improvements in the bill collection efficiency as that could serve as incentive if the bill collection component of the operation is to be outsourced.

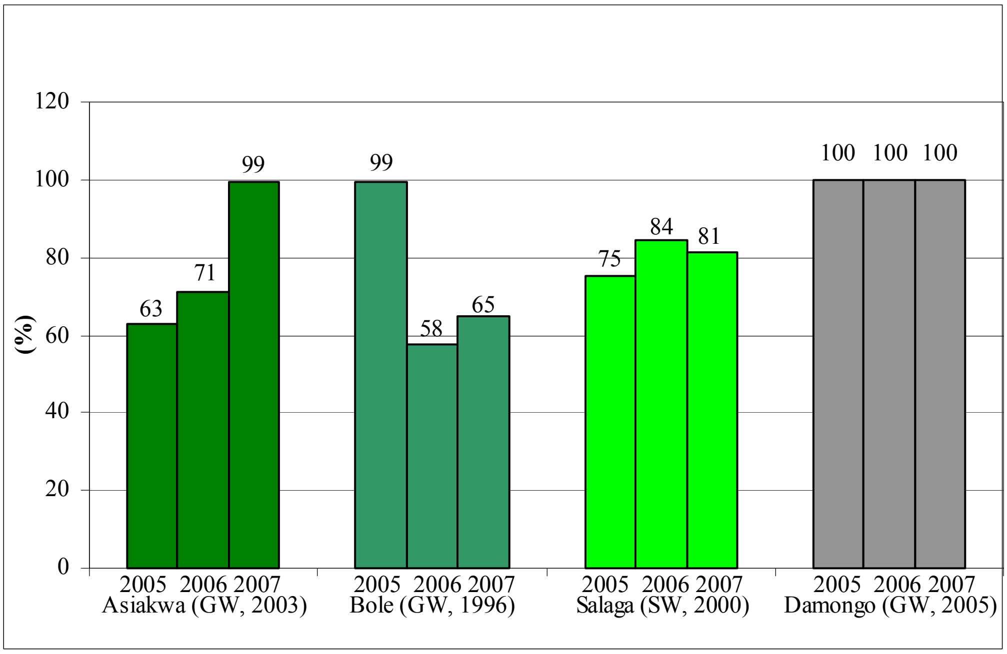

Figure 4.16 Bill collection efficiencies for Asiakwa, Bole, Salaga and Damongo

4.3.5 Investments and revenues

It is reported that investments in the water sector in Ghana are driven by what the donors are willing to invest rather than what the Government or consumers actually require to meet the national need (Fuest and Haffner, 2007). As discussed in earlier sections investment in small towns water supply schemes is subsidised to levels not less than 95% for the 'basic service'. It is expected that any further investments will be borne by beneficiary towns from the revenues generated through water sales. As shown in Figure 4.14 some small towns hardly generate enough revenue to meet their recurrent operations through water sales and therefore do not make any further investments. The investments per capita and revenues per capita put together measure financial sustainability of the operations over the life of the system. It should be noted that any investment figures in Ghana have been affected over the years by both inflationary pressures and the depreciation of the local currency thereby making the investments unstable over time. This is crucial to the smooth operations of water supply systems since spare parts and equipments are imported in foreign currencies but revenues are generated in the local currency.

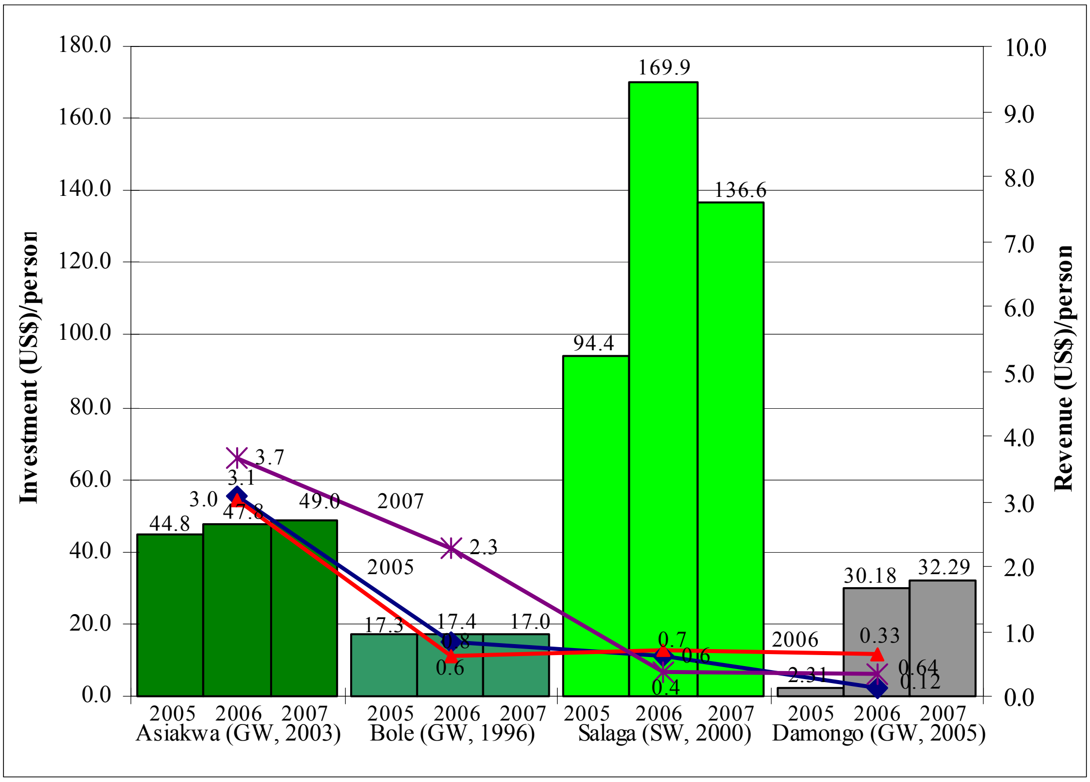

Figure 4.17 Investment/person against revenue/person in Asiakwa, Bole, Salaga and Damongo

Figure 4.17 shows the investment/person and revenue generated/person over three years (2005, 2006 and 2007) in Asiakwa, Bole, Damongo and Salaga systems. Salaga water system which is designed, like many other urban water systems, with a conventional treatment plant has shown over the three years relatively higher figures. The investment per capita figures in 2006 and 2007 in Salaga are higher the US$31 – US$102 Africa average found in literature (WHO/UNICEF, 2000). This is an indication that designs of small towns water supply systems must be carefully selected not to raise the investment per capita above what the people can support through revenue payments.

4.4 Human resources and organisation

This section assesses the efficiency and quality of the human resources as input, considering only the full time staff. In small towns water supply in Ghana, in addition to the full time staff, there are also commissioned water vendors who manage the public standpipes, each vendor receiving a 20% commission on their sales. However in Damongo the vendors from 2007 have been receiving fixed monthly allowances from the operators irrespective of their sales. The performance indicators discussed in this chapter are: staff productivity index, staff qualification and finally subjective capacity descriptors based on the author's conversations and observations.

4.4.1 Staff productivity index

A staff productivity index is an efficiency measure of the human resource as an input to the production process and (Nickson and Franceys, 2003) have indicated that a staff productivity index of less than ten staff per thousand connections may initially be a reasonable starting point for water supply systems of large urban cities in lower-income countries. For small towns a lower staff productivity index (higher number of staff per thousand connections) would be expected due to limited economies of scale. However, a measure of the acceptable staff productivity index for the small towns has not been determined for Ghana and where there are such a limited number of connections it is not realistic to use this conventional ratio. An alternative ratio considers the staff required per 1,000 population served. CWSA recommends five staff for towns with a population of 10,000 or more (CWSA, 2004b) which suggests a maximum of 0.5 staff per 1,000 people served. This study therefore investigates the actual staffing ratios relative to that indicator and the same indicator is used in Chapter Five and Chapter Six.

Figure 4.18 shows that only Damongo was able to measure a better performance than the CWSA benchmark in 2006 and 2007 and its worse in 2005 better than the other three systems. However between 2005 and 2007, Asiakwa and Bole recorded some improvements in their indices but because Salaga did not have its standpipes functioning in 2006 and 2007 its index in 2005 worsened in 2006 and 2007. It should be remembered that by the CWSA design estimates, each standpipe is estimated to serve 300 people. The differences in the staff productivity indexes of the three small towns are attributable to the relative sizes of the water systems as shown by number of connections in Table 4.1 above, since all towns go by the CWSA staff requirements.

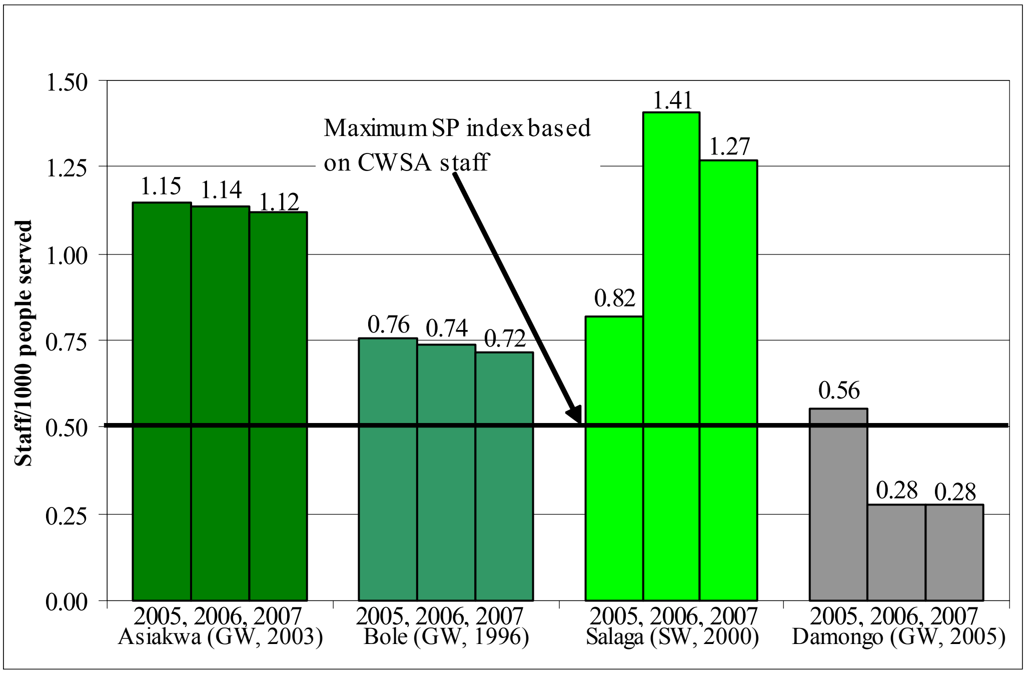

Figure 4.18 Staff/1000 people served

Another staff productivity indicator used to assess the efficient use of staff in this chapter is the water produced per staff per year as shown in Figure 4.19 below.

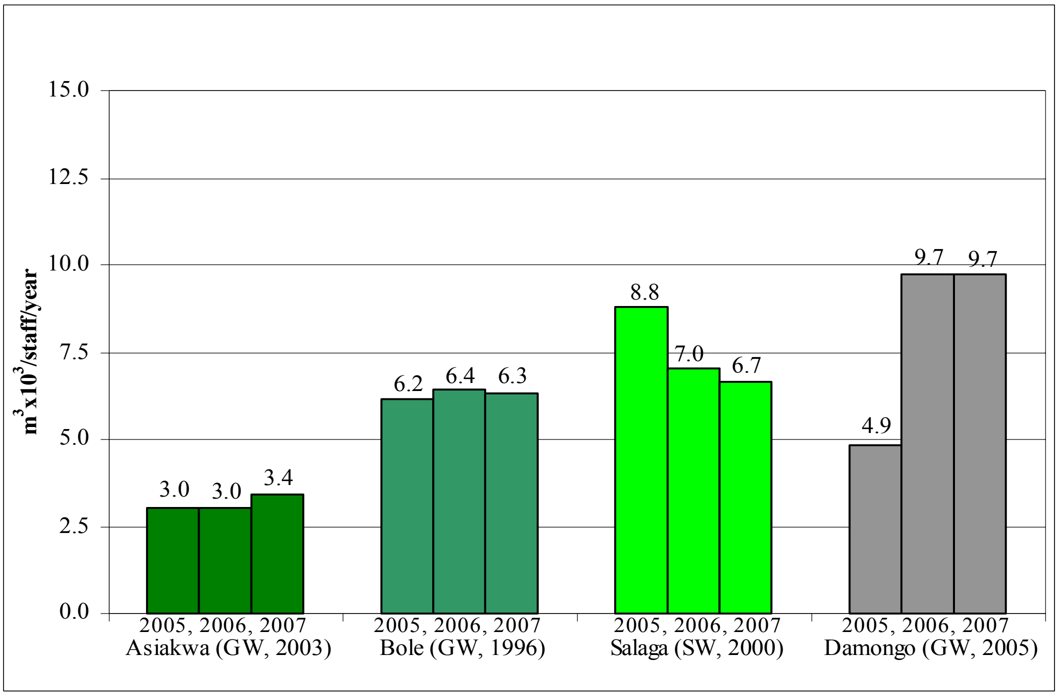

Figure 4.19 Volume of water produced, m^3x10^3 per staff per annum

It is significant to present the two productivity indicators together in order to appreciate the real productivity of the staff in terms of water production, a core business of the water supply systems. A significant observation is that while the staff per 1,000 persons served indicators reduced between 2005 and 2007 for Asiakwa, Damongo and Bole water systems, the volume of water produced per staff increased for Asiakwa and Damongo and mixed trend by the Bole system. The increased in Damongo in 2006 and 2007 was due to the additions of more mechanised boreholes in 2006 by the EU. Salaga on the other hand which recorded a mixed trend in the staff productivity index, shows declining performance regarding the volume of water produced per staff. Overall, Salaga still recorded higher volumes of water per staff in all three years than Asiakwa and Bole but less than that of Damongo in 2006 and 2007.

Similar to the staff per 1000 people served, the water produced per staff performance indicator has more to do with the size of the system provided through government agencies than a measure of the operators' performance. But unlike the staff per 1000 people served, whose improvement over time cannot wholly be attributable to the operators' performance as discussed earlier in this section, improvement in water produced per staff indicator may be attributable to the operators' performance. The relatively better water produced per staff recorded by Salaga and Bole has been eroded by the high unaccounted for water recorded relative to Asiakwa as shown in Figure 4.9.

4.4.2 Staff qualifications

The community managed small towns water supply systems have three key staff on their operations; Technical Manager, Operator and a Financial/Administrative staff member. The new Small Towns Sector Policy (Operation and Maintenance Guidelines), yet to be operationalised, has recommended an additional two people, a Cashier and a PRO position, both expected to be drawn from the WSDB (CWSA, 2004b). The minimum staff qualification requirements prescribed by the policy (CWSA, 2004b) have been adapted by the author and presented in four categories; Tertiary qualification (e.g. university, polytechnic, etc.) which is given a score of 5, Post-secondary/secondary which is given a score of 3, Basic education with a score of 2 and no education given a score of zero (0), are used for the analysis. A score of 15 represents the highest score and zero (0) the minimum score. From the minimum qualification requirement set by the Small Towns Sector Policy for the three key staff, a score of 9 is expected which represents 60% of the maximum score.

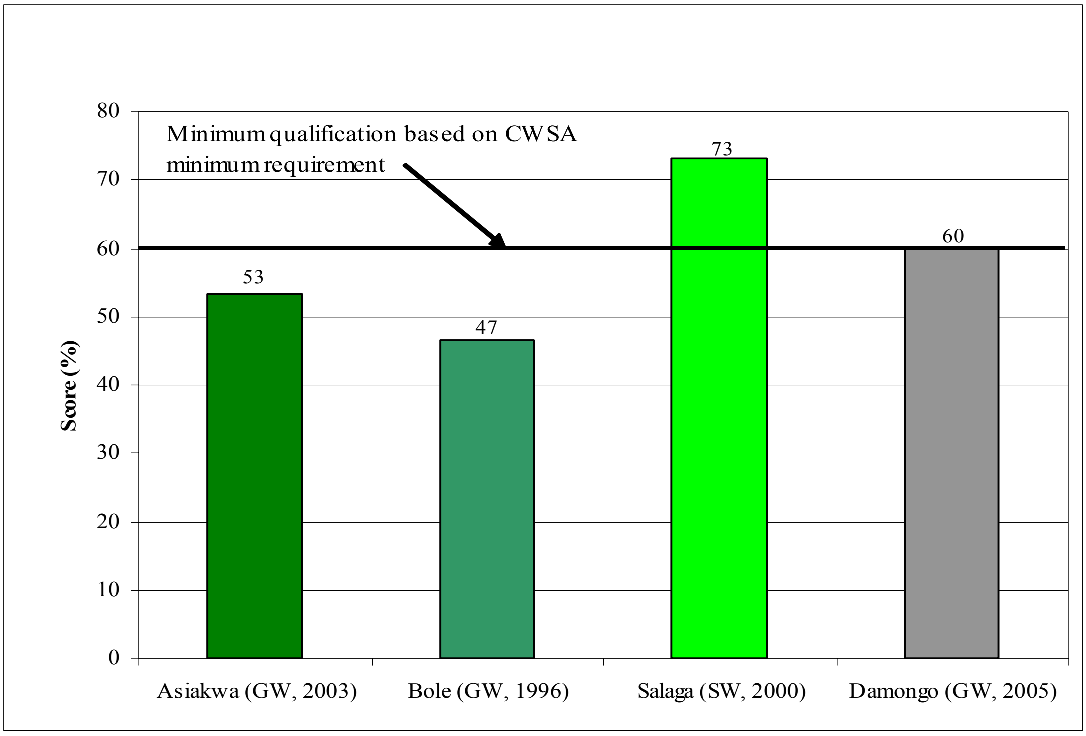

Figure 4.20 Qualifications of key staff expressed as percentage of total score

In all four towns the same staff have been working on the water systems since, before 2005 and this is not unusual in community managed small towns systems in Ghana. Staff on the systems are mostly treated as volunteers and do not receive any competitive remuneration. Their recruitment tends not to be based on competence but on other factors. In Bole and Salaga where the water systems were built under Ghana Assistance Project (GAP) "the staff were selected based on interest and not on qualification" (Source: Bole System Manager). The current staff on the Salaga system were put there after the new government took office in 2001, after those recruited by GAP were removed for socio-political reasons. On the other hand in Asiakwa the Financial/Administrative officer was recruited by the water and sanitation development board (WSDB) through a competitive search. The pump operator was one of the staff of the contractor who worked on the system but decided to leave him to operate the system. The staff of the Damongo water system were recruited by the District Assembly as there was no WSDB because the system originally was under the GWCL till the water in the source could not support pumping. The current system as will be recalled is an emergency intervention by the EU.

Figure 4.20 shows that Salaga scored highest and Bole scored least. Asiakwa and Bole have scored below the minimum score of 60% but a careful view of the performance of the systems does not show Salaga performing better than the other towns. In Salaga the Manager is the chairman of the WSDB and also a full time teacher at the Senior High School and this does not allow him enough time to focus on the water supply issues which he performs voluntarily without any form of payment. In Asiakwa, the Manager, also a trained teacher but on retirement, was the WSDB chairman who decided in 2007 to relinquish the chairmanship position which is voluntarily to take up the paid job of a Manager. The Manager of the Damongo system is a full time manager on the system and has had training on repairs of boreholes. In Bole, the District Coordinating Director (DCD) indicated that "the academic qualifications of the staff on the Bole water system are a major contribution for their inability to manage the water systems properly".

Training programmes are vital in upgrading staff of the water systems, however, none of the systems have their own training programmes and only attend any training programme that is organised by the donor organisations. During construction of the water projects consultants were used to train all staff on the systems and it is therefore important for staff retention on the systems to be encouraged. In Salaga all the staff who received training either resigned or were dismissed due to political influence between 2001 and 2004. The Kwame Nkrumah University of Science and Technology in Kumasi and Tamale Polytechnic have each developed training programmes targeting system managers and operators in small towns and rural water systems which operators could take advantage of if they so wish.

4.4.3 Subjective capacity descriptors

This section presents the results of the assessment of the capacity of the water supply systems undertaken by the author following the fieldwork visits and key informant interviews in each location. The assessment, following the WASH approach (Cullivan et al, 1988) has been undertaken under six headings; Leadership, Organisational autonomy, Management and administration, Commercial orientation, Consumer orientation and Organisational culture. The capacity descriptors, necessarily 'subjective' as scored by the observer researcher, were scored on a scale of 1 – 5 on a number of items under each heading and the average scores for each heading are presented in

Figure 4.21below. Five is a high score and 1 a low score. Please see Appendix IV for the detailed scoring questions.

Using this methodology the researcher estimates that Asiakwa is operating with a higher capacity in all descriptors with average scores above 3.0 and on average Damongo performed better than Salaga which also performed better than Bole. In terms of leadership, the example of Asiakwa where all staff gather at the office to discuss the performance of the water system led by the manager is worth emulating by the other systems. It is difficult to identify the manager when one meets them in such discussions. In Damongo the staff share one office and are always together and occasionally also meet with the vendors who have access to the manager all the time. On the other hand in Bole the Manager's office is located far away from the other staff and they hardly even know each other are in the office and no staff meetings are called to discuss performance. Salaga does not even have an office but the staff meet at the pumping station when there is a need.

In Asiakwa the water board organises community meetings at irregular intervals but this is better than in Bole (except in 2006), which is also better than Damongo and Salaga where such meetings are not called at all. So much for 'community management'. Again in Asiakwa the annual financial records (summary) of the water system are pasted on their notice board outside the office and are accessible by any community member but this is absent in Bole, Damongo and Salaga. Unlike the rest of Ghana where water operators wait for central government to make the payments of the government institutions' consumption, in Asiakwa the water system has an arrangement with these institutions to pay their water bills from the institutions own resources. In Damongo the operator does not face that challenge as they do not supply such government institutions directly.

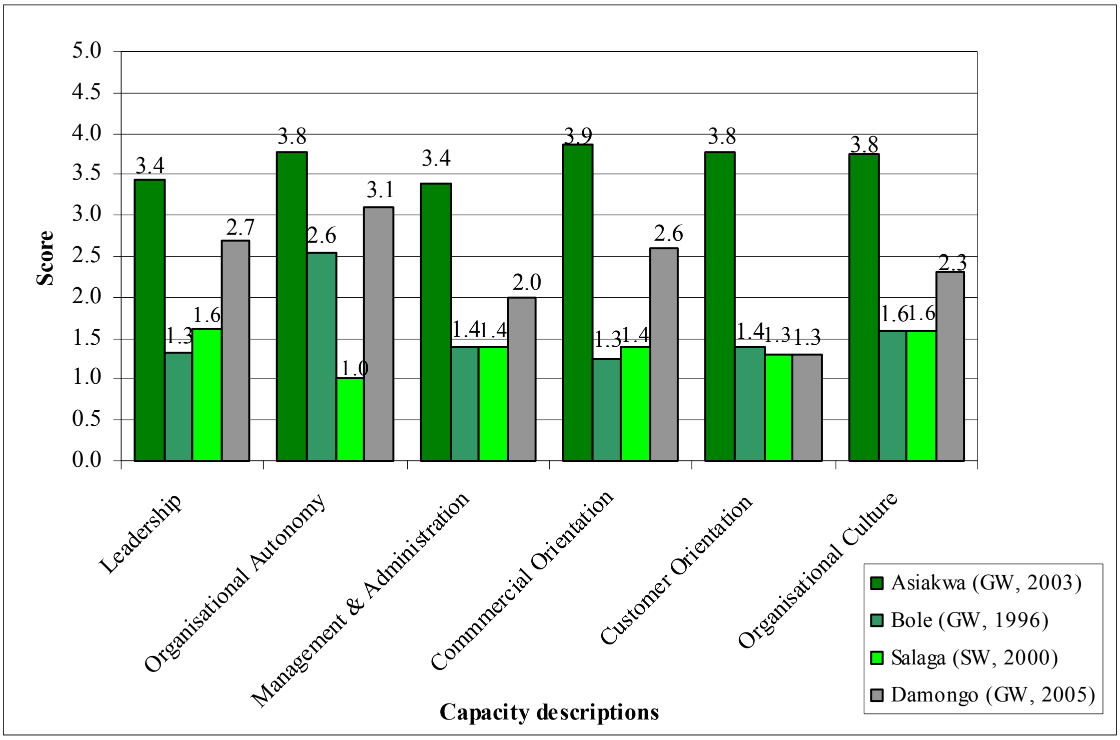

Figure 4.21 Subjective capacity descriptors

Data collected and analysed based on Cullivan, et al (1988) and Franceys (2006) descriptors.

On autonomy, Salaga performed poorly because the WSDB which operates the water system is not allowed to take decisions about the operation of the water system without consultation with the political leadership of the town especially so when the operations of the water system are financed by grants from the District Assembly. In Salaga, the selection of the members of the WSDB is based on political considerations and anytime there is change of political leadership the members are also changed.

4.5 Chapter summary

In the chapter it has been shown that in the community managed small towns in Ghana coverage figures recorded by house connections are very low compared to the coverage by public standpipes. In Asiakwa and Damongo the contractors who built the projects are still responsible for the maintenance of the system and, with the contractors easily reached by the operator, this has accounted for the low breakdown times as compared to Bole and Salaga, who have to go in search of mechanics for their systems. In all four small towns none of the operators is providing water to customers to match the CWSA basic service of 20 litres per capita per day

It has also been calculated that none of the four systems are charging cost reflective tariffs with their levels varying from town to town. In all four towns there are gaps between investments, recurrent expenditures and revenues, questioning the sustainability of the systems. With the exception of Asiakwa none of the other three operators have live depreciation/replacement accounts and Asiakwa has only able to accumulate about 30% of the required accumulated depreciation.

In the chapter it has been shown that a staff productivity index of 0.5 staff per 1000 people served is satisfactory for small towns in Ghana and that a higher score for qualification as prescribed by the CWSA does not necessarily translate into better performance of the water systems. But effective leadership offered by the manager is a key driver of performance as shown by the subjective descriptors in relation to the performance indicators.

The three years presentation of the results in the chapter has not provided any meaningful trends for any analysis for the different operators being investigated but has enabled the elimination of some particular, but irrelevant, scores.

In conclusion the chapter has shown that the close monitoring by the District Assembly in Bole in 2006 resulted in improved services of the operator in 2007 in most of the indicators. However, at present it is not possible to claim that the community management model of operating small towns water services is sustainable and cost effective. It has been established that the community managed systems investigated, do not involve the communities in decision making as claimed by literature, system managers have not been accountable to the entire community but instead to the District Assemblies.

As a management model, none of the systems can be described as community managed water supply in the true sense of it in the context of Ghana as all the systems are being managed as smaller public utilities.

CHAPTER FIVE

5 Performance of private operator managed water supply systems in small towns in Ghana

5.1 Introduction

In this chapter, the results of the two private operator-managed water supply systems in small towns are given to enable a comparison of performances between the models. This comparison is very important since the introduction of private operators in the management of small towns water supply was meant to improve efficiency, reduce political interference and increase accountability (Fuest and Haffner, 2007) which were presumed to be absent in the community managed model, however much that model was presumed to benefit through other qualities. In this chapter the validity of these stated characteristics would be ascertained, at least in the specific case of small towns in Ghana. The unique quality of the private operator managed systems is that the profits of the private operator serves as an incentive for efficient service delivery by reducing cost to maximise the profits. In this chapter it would be established how far such incentives have contributed to service delivery among the two operators.

The two private operator managed systems are Atebubu in the Brong Ahafo Region and Bekwai in the Ashanti Region. The private operator managed model is another example of a delegated system of management where the WSDB, delegated by the District Assembly to perform the function of providing water supply services, further delegates to private operator to deliver the service on its behalf.

At the inception of the National Community Water and Sanitation Programme (NCWSP) in Ghana the role of the private sector was limited to the provision of goods and services, such as the supply of spare parts, consultancy and construction. However, after almost a decade of implementation of NCWSP, a study was commissioned through the sponsorship of the Public-Private Infrastructure Advisory Facility (PPIAF) to assess the possibility of involving the private sector in direct management of small towns is discussed in Chapter One. Atebubu and Bekwai are currently the only towns where private operators have been contracted to manage the water supply systems as at 2007 when data for this research were first collected, probably because of their population. (Manu, 2001) estimates that full cost recovery for water supply service is only possible in towns with population above 20,000 people. But CWSA has been quoted as encouraging towns with population above 12,000 to involve private operators to manage their water systems (Eguavoen and Youkhana, 2008) which expands the towns eligible for private sector participation in the management of small towns water supply.

The institutional structures such as DWST and WSDB are still in existence in this new arrangement but with the responsibility of WSDB limited to entering into a contract with the private operator and supervising/monitoring their operations. Therefore the roles and responsibilities contained in Table 1.2 are also applicable in this management model.

The Operation and Maintenance contracts signed between Atebubu WSDB and Armco Ltd and between Bekwai WSDB and Vicco Ventures, sighted by this author, are similar and seemed to be generated from the same template. This raises a concern as to the extent to which the WSDBs were involved in the preparation of the terms and conditions in the contracts. Comments from the WSDB in Atebubu and the DWST in Bekwai confirmed this concern. In Atebubu the WSDB intended to manage the water supply themselves but that was rejected by the donors and CWSA citing the complex nature of the system as the reason why a private operator must be contracted. Box 5.1 captures the comments of the WSDB in Atebubu on the issue. The WSDB in Atebubu also complaint about the nature of the contract which prevents them from getting involved in the operations with their role limited to only receiving reports from the operator which they do not have the means to verify. “The contract is not fair” (comment during interview, 2007).

Box 5.1
“When the water system was completed, WSDB wanted to manage it but we were told the system was complex for us and an operator must be involved and when we insisted we could do it, the EU officer said it is their money and we have to do what they want”.

On their part, the DWST at Bekwai complain that the contract has not been fair as it provides the private operator 75% of water sales revenue but ‘does not even require them to finance any expansion to new areas’.

Though the contracts are legally between the WSDBs and the operators, the District Chief Executives of the respective Districts witnessed for their WSDB while CWSA representatives witnessed for the private companies. The Manager of the Atebubu water system indicates that the contract they have entered into is between their company and the District Assembly. This is a clear case of misunderstanding of who they are reporting to and this might be a result of the over bearing authority exerted by the District Assembly. It is even more worrying for the WSDB to also indicate that the contract is between the operator and the District Assembly when it is indeed between the WSDB and the operator. The responsibility for managing the contract from Table 1.3 is the District Assembly. This places the WSDB in a position where the operator does not consider them playing any role in the Atebubu water supply and therefore does not give any reports of their performance to the WSDB but rather sent them to the DWST. It was not surprising therefore that when the District Assembly declined renewing the contract of the private operator at the end of the contract in 2007 the WSDB was also dissolved allowing the DWST to manage the water system directly. The WSDB in Bekwai on their part work closely with the private operator and receive copies of reports submitted to the District Assembly, probably this is because the operator and the WSDB share an office block. The WSDB however believe that the private operator understands the water supply business better than them and therefore they need to learn from the operator. This attitude has the tendency to allow the operator to do what they feel is appropriate instead of following the contract they have signed.

In Bekwai the DWST is not active in the small towns water operations and the WSDB and the District Assembly are into confrontation with each other as to whose responsibility it is to supervise the operator. Some conflict between the District Assembly and WSDB discussed later has resulted in the operator receiving a renewal of its contract after it ended in 2007 from both bodies which for the operator is confirmation of the confidents. Before the conflict the WSDB was directly responsible for monitoring the private operator and it was the body receiving all reports from the operator unlike in Atebubu.

In addition to the roles and responsibilities provided by NCWSP and contained in Table 1.3, by signing the contract with the private operators:

1. *"The WSDBs commit themselves to put at the disposal of the operators, in good working order, all the water supply facilities.*
2. *Except operation and maintenance works and those entrusted within the contracts, all other works concerning the water supply systems shall be the responsibility of the respective WSDBs.*
3. *The WSDBs and the respective District Assemblies shall keep control over the water services and shall obtain all necessary information from the operators in that respect, in order to ensure their rights and duties.*
4. *The private operators are responsible for the good operation of the service, as it is defined in the contract. It is authorised hereby with consultation of the District Assemblies to collect from users a price, aimed for the remuneration of their services. They operate the systems at their own risk"* (source: Extras from the Operation and Maintenance Contracts).

5.1.1 Case studies context

Similar to Chapter Four the key context information about the case studies is presented in Table 5.1 and it can be observed that, unlike in Chapter Four, system age is not a contributor to any differences in performance of the two systems as both systems started operations in 2002. However Bekwai has a bigger system than Atebubu looking at the number of connections whilst Atebubu has a much more complex source of water. The key contextual information that is likely to influence the operators' performance is the raw water source and the power source.

The schematic diagrams below show illustrations of the small towns, their water sources and their relative positioning with each other and to the households. The diagrams are not drawn to scale.

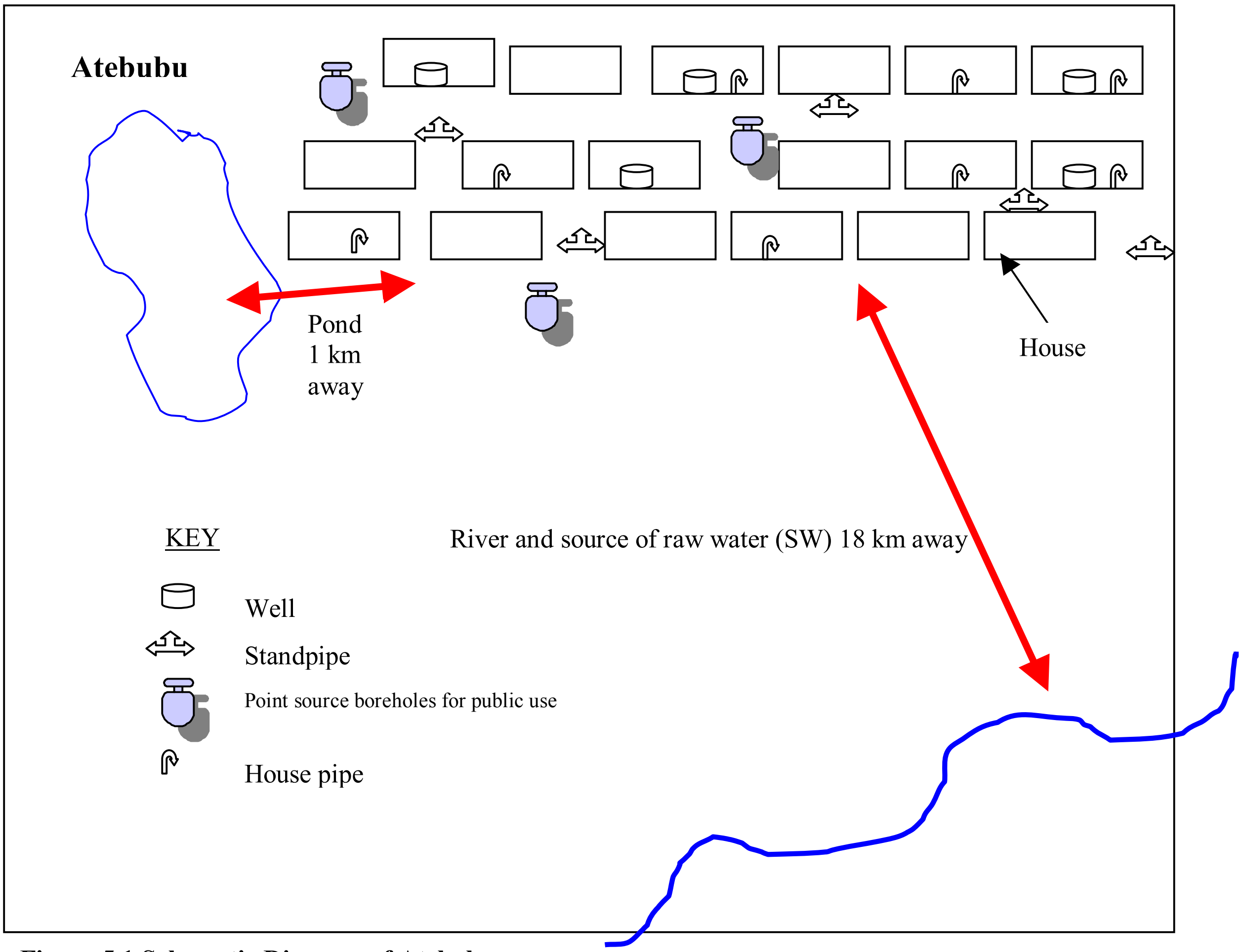

Figure 5.1 Schematic Diagram of Atebubu

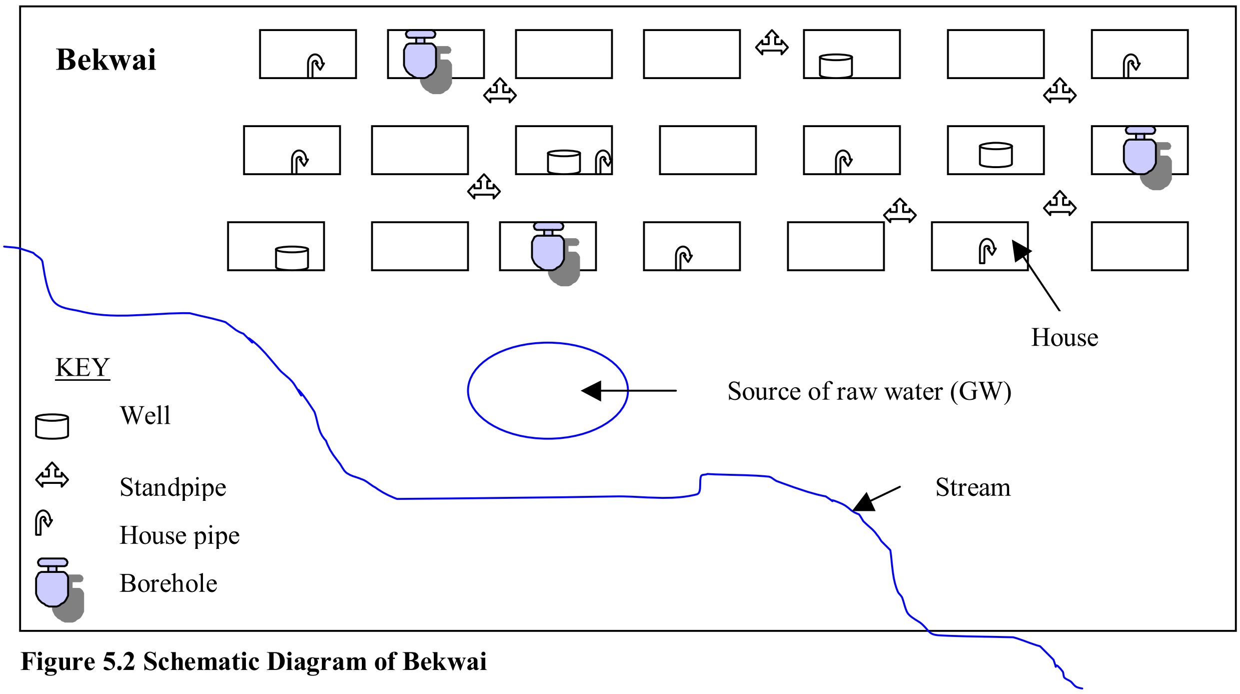

Figure 5.2 Schematic Diagram of Bekwai

In line with the NCWP tariff setting by both operators were expecting to be discussed with the communities and the outcome of the consultation process communicated to the District Assemblies for approval. However in 2006 both operators increased their tariffs and while the Bekwai operator discussed the proposed new tariff with the WSDB before getting approval from the District Assembly the operator in Atebubu obtained direct approval from the Assembly without any serious involvement of the WSDB. None of the operators as required consulted the community people with the unacceptable excuse that the WSDB adequately represent the people. The communities do not therefore participate directly in the water supply provision a situation that is not acceptable under NCWSP but the inability of the CWSA to interfere directly has further compounded the situation.

In terms of incomes, the per capita income for the Brong Ahafo where Atebubu is located is US$406.50 and that of the Ashanti Region where Bekwai is located is US$376.20 (GSS, 2008) which also compares to the household survey figures shown in Table 5.1. The closeness of the household per capita income levels in Table 5.1 to the regional averages suggests that, small towns in terms of their wealth lie between the least wealthy rural and the wealthiest urban settlements.

The climatic condition of both Atebubu and Bekwai is described as Transitional between the Guinea Savannah of the north and the Deciduous Forest of the south and experiencing two rainy seasons and a dry season (He et al., 2007). Atebubu is closest to the Guinea Savannah while Bekwai is closest to the Deciduous Forest zones and these locations have influenced their climatic conditions as Atebubu have features of the north and Bekwai show features of the Deciduous Forest.

Administratively both Atebubu and Bekwai are the district capitals of their respective District Assemblies.

Similar to the community managed towns, in both towns there exist multiple alternative sources of water which are free for use by consumers. Which source to use for which households' activity varies based on the perceived quality of the source and the use.

Household water consumption is therefore distributed among these different sources. In Atebubu where the water system depends on surface water as its raw water source, the source and treatment plant are situated 18km away from the township. The boreholes that feed the water system in Bekwai are however scattered round the town with the farthest one located less than 3.5km from the town centre. The source of power for the treatment and transportation of the treated water in Atebubu are two diesel engines while Bekwai depends on electricity from the national grid. The unstable crude oil prices at the beginning of 2006 which continued into 2008 have had effect on the operations of Atebubu water system.

The table below shows the context information on each town and water system that could affect the overall performance of the water system discussed in later the chapter.

Table 5.1 Context information for private operator managed water supply towns

Context Information		Atebubu	Bekwai
*Projected population (2008)		24,397	25,716
*Population growth rate (%)		4.5	3.0
Average household size		9.0 (0.821) (3 – 29)[4]	6.7 (0.393) (1 – 14)
Average per capita income($/annum)		441.83(102.25) (10.42 – 4072.23)	330.59(45.30) (15.15 – 1378.33)
Number of household connections	2005	162	320
	2006	185	364
	2007	231	424
Number of stand pipes	2005	33	40
	2006	33	40
	2007	34	41
Source of raw water used by operators		SW	GW
Source of power		Diesel Engines	National grid
Topography		Fairly flat	Hilly
**Average annual Rainfall (mm)		1191	1700
Year of commencement of project		2002	2002

The figures in parenthesis represent the standard error of the mean and the minimum and maximum figures recorded. *Source: 2000 Population and housing census. ** Source: http://ghanadistricts.com (accessed 15/08/09). Note: GW = Ground water and SW = Surface Water.

[4] The large maximum figures are because some household heads teach the Qur'an and the pupils live with them till their completion and this could take several years and also because polygamy is part of the culture of the people in the towns.

5.2 Level of services provided by operators

The quality of service indicators assessed in this section are limited to service coverage, breakdown times in a year, water availability in a day and per capita water supplied to households as presented in Chapter Four.

5.2.1 Service coverage

In each of the towns, customers are served with water through a mix of public standpipes and household connections. As shown in Table 5.1, household connections have been increasing from year to year but it was only in 2007 when one hydrant each was added in each town for the exclusive use by the Fire Service.

In each of the three years for each town, the proportion of the population served by household connections increased over the previous year while the proportion of the population served by the public standpipes declined. The inability of the water supply systems to add any public stand pipe since the completion of the projects coupled with the rapid population growths of the towns are the contributing factors for the trend described. In both towns more consumers resort to the standpipes than the house connections.

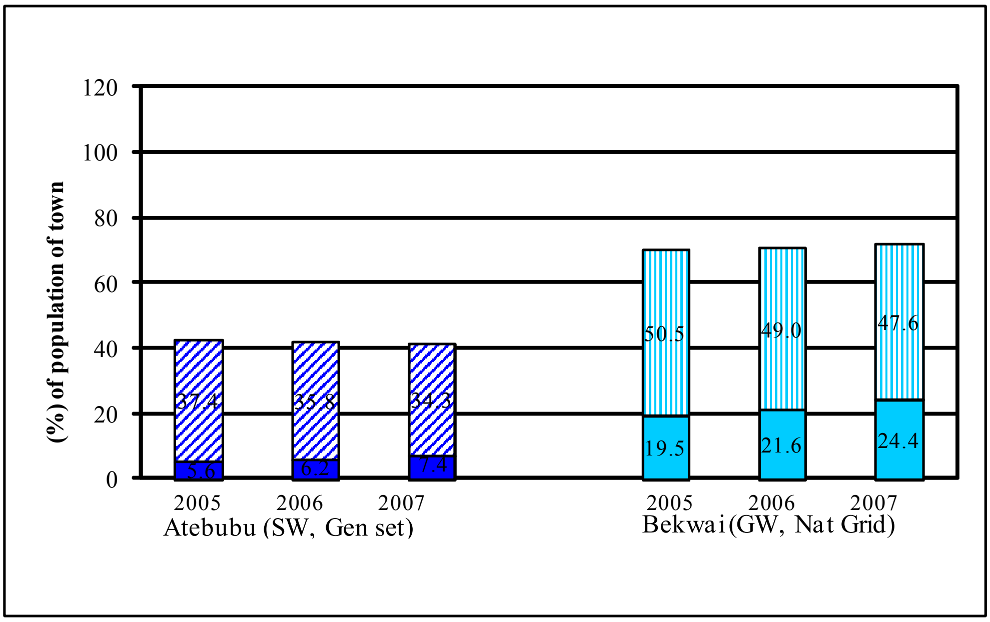

Figure 5.3 Percentage of towns' population served by household connections and public standpipes

Note: Lower charts represent coverage by house connection and upper charts represent coverage by stand pipes.

In each of the towns, as shown in Figure 5.3, the water supply systems are unable to provide 100% coverage but Bekwai shows better coverage figures than Atebubu. The theoretical coverage figures recorded for Atebubu and Bekwai show the need for expansion of the water systems especially in Atebubu where the coverage is less than 50% of the population. This situation is justifying the continued existence of the alternative sources of water in these towns in order to meet households demand.

5.2.2 Breakdown time

The breakdown time indicator as indicated in Chapter Four already measures the service quality and it is represented as the percentage of the year the water system breaks down and from Figure 5.4, Bekwai performed better than the 5% benchmark of the CWSA.

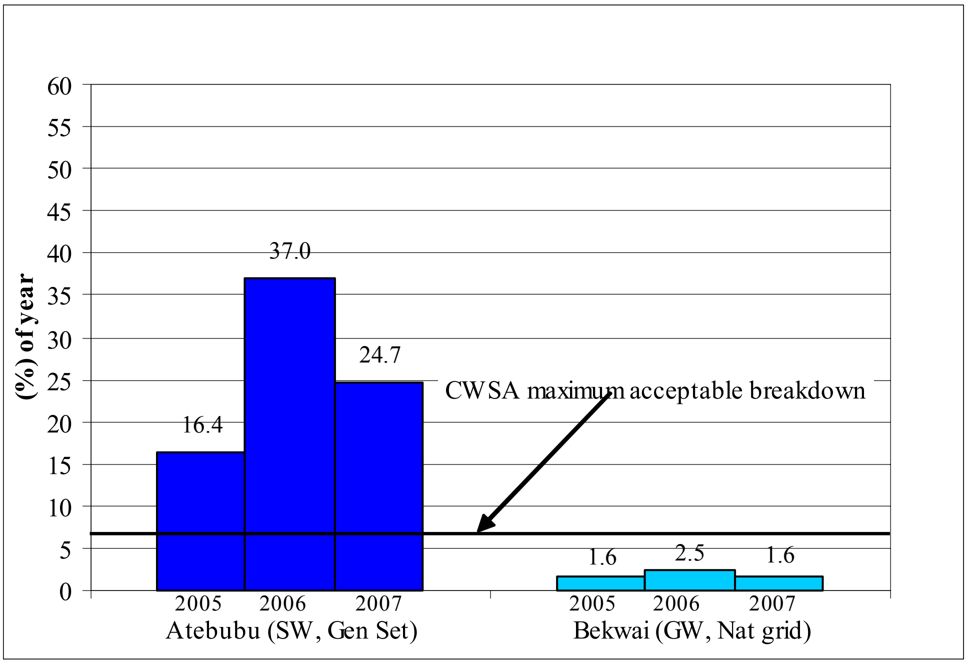

Figure 5.4 Percentage of the year water supply systems breaks down

The DWST in Atebubu considers the breakdown of the generators as the major source of interruption to water flow and according to the team "depending on the availability of funds, it takes up to two months to fix a breakdown". In 2006 a pipe burst along the 18km transmission line interrupted water flow into the town for 60 days and within that period the inability to trace the point of the burst raised some socio-cultural concerns (see Box 5.2) which have further revealed the complexities that exist in some small towns water supply.

Box 5.2
In 2006 there was a burst on the transmission line between the treatment plant and the high lift tank (HLT) which caused water not to reach the tank and because it was rainy season the flooding was attributed to heavy rains. The chiefs and elders of Atebubu then attributed the inability of the water pumped to get into the HLT to the 'anger' of the gods of the source river for not pacifying it but drawing its water. The operator was then made to provide a white ram which was used to pacify the gods of the river and a white cock which was used to pacify another river considered as a 'friend' of the source river. Eventually the pipe burst was discovered where the transmission main crossed a 'marshy' area. (Source: Interview with WSDB)

Despite the existence of a Procurement Law which guides operations at the District Assemblies this law is not being obeyed, resulting in the operator in Atebubu prolonging the down-time of the water system, an indiscretion in 2006. The quote from the System manager explains this point further. "In 2006 there was an occasion when we decided to deal with individual mechanics privately to repair our broken down engines. We had to pay US$6,238.29 (conversion by author) but they still did not work and after just two more months we had to send the engines to GWCL through the proper procurement process in order to ensure the repairs were done properly". The pipe burst and the bad repairs procurement in 2006 contributed to the high interruptions. The Atebubu and Bekwai systems rely on mechanics and electricians from GWCL in Kumasi, 120km way from Atebubu and 35km from Bekwai to fix any breakdown of their systems. The operator in Bekwai indicated that due to the prompt payment of mechanics who service their machines they are always at hand when they need them and in some cases the mechanics privately call to enquire whether the operator has jobs for them.

In Atebubu the WSDB, which supervises the operations of the operator, indicated that in the contract, the operator was to pay a penalty any time there is a non-justified interruption. "If the operator fails to justify any problem that results in a breakdown of the system to the WSDB within 12 hours, the operator shall pay" an equivalent of US$18.69 (2007 figures) for each hour of interruption after the first 12 hours. The WSDB has not been able to enforce that rule. The operator confirmed this lack of enforcement of penalties by indicating that, they do not pay any penalties when they "do not deliver as required". This raises the question of whether the various WSDBs have the capacity to really monitor adequately the private operators contracted to manage small towns water supply systems and therefore justifies the involvement of the District Assemblies.

5.2.3 Water availability

In both Atebubu and Bekwai customers with household connections enjoy 24 hours of water flow while those using the standpipes receive water at the times that vendors operate. The operator in Bekwai cites availability of time as the main reason why majority of the standpipe vendors are women. The women they reported are content with the 20% commission whilst the men are always asking for upward adjustment. In both towns the commissioned vendors operate for eight hours a day but both contract documents provide for 13 hours a day. However the high annual interruptions rates of the Atebubu water system suggest an unreliable service delivery to consumers compared to Bekwai.

5.2.4 Water consumption

The per capita water supplied figures for the two towns were obtained from the volume of water sold according to the operators' records and dividing that by the theoretical number of people served. In all three years Bekwai operator was able to provide per capita water consumption above the basic level stated in chapter four but Atebubu could not.

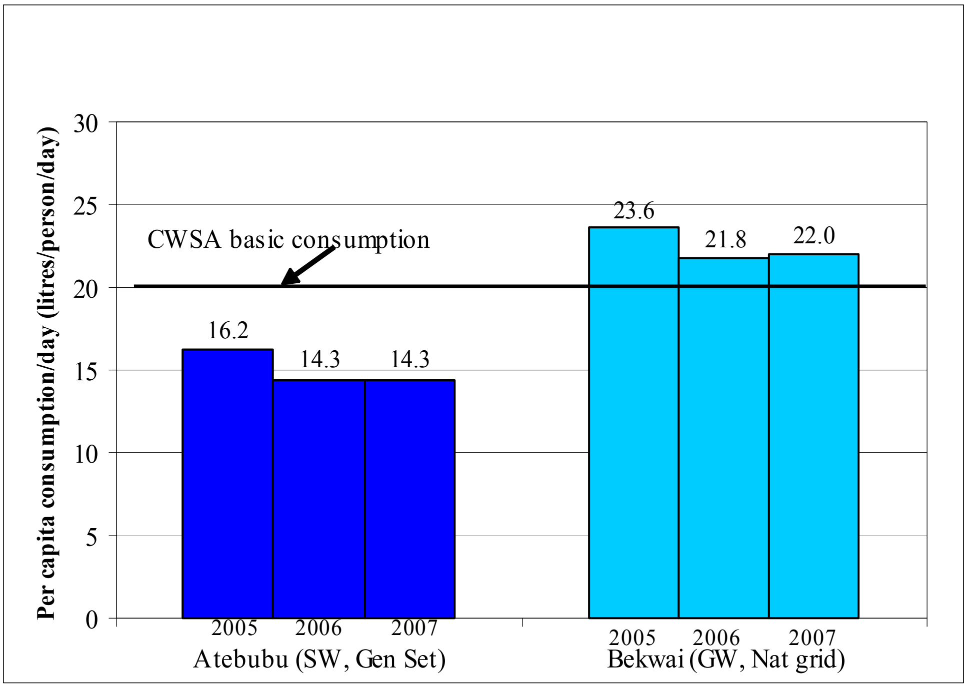

Figure 5.5 Per capita water consumption based on annual water sold by operators

In Atebubu, the operator, the WSDB and the DWST all blamed the availability of alternative sources of water especially in the rainy season for the low consumption figures, though there was no indication that the water produced was not consumed. The operator in Bekwai also indicated that customers with house wells still use them and in some cases they sell the water from the wells to their neighbours as some people still consider water from the pipes not 'sweet' for drinking. This is an indication of the existence of customer demand for alternative sources of water over and above what is being provided by the operators.

5.3 Economic and financial performance

Following the same pattern as the previous chapter, in this section the critical performance indicators of tariffs, cost of supply, operating ratio and investments per capita are examined.

5.3.1 Revenue losses as water lost

Figure 5.6.below compares the unaccounted for water for Atebubu and Bekwai water systems in 2005, 2006 and 2007, recognising that CWSA considers unaccounted for water of not more than 15% as a measure of water resource sustainability (CWSA, 2004b).

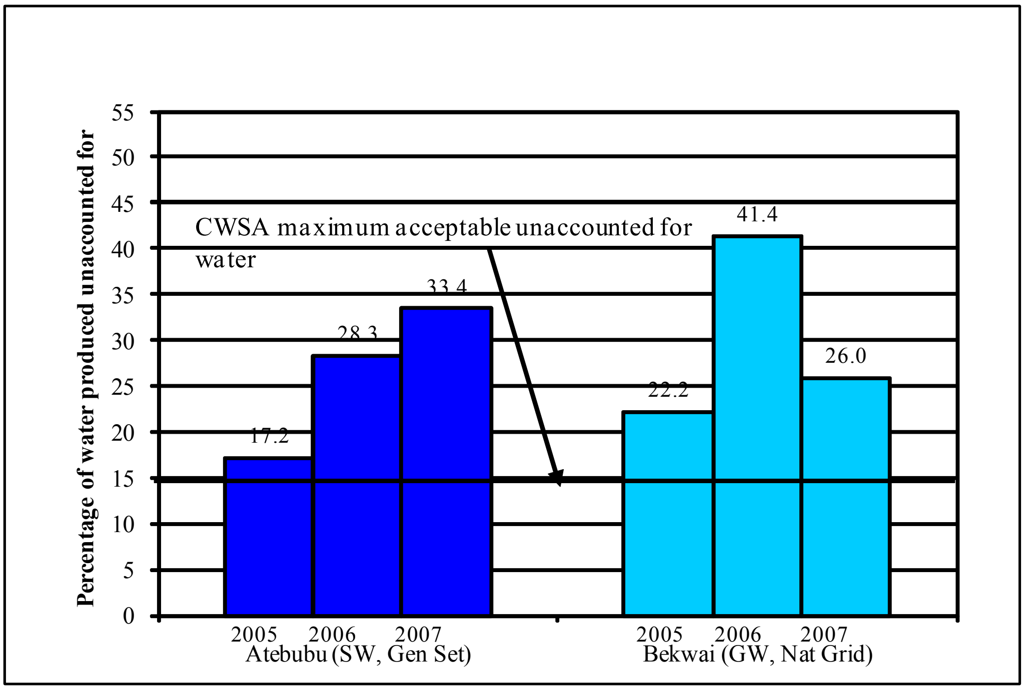

Figure 5.6 Percentage of water produced that is not accounted for annually

In Figure 5.6, neither of the operators in any of the three years is able to control the unaccounted for water to the CWSA benchmark. While Atebubu has shown worsening trends, Bekwai which recorded in 2006 almost twice the unaccounted for water recorded in 2005, managed to reduce the 2006 figure to a little below half in 2007. The pipe burst that resulted in an increased in breakdown time for the Bekwai system as shown in Figure 5.4 also resulted in an increased in the loss of water in the distribution system. Unlike Bekwai, Atebubu was not able to institute any measure to reduce the increased unaccountable for water in 2006 as a result of the pipe leakage that called for spiritual intervention as discussed earlier. The operator however could not assign any reason to account for the increased unaccounted for water in 2007.

5.3.2 Metered connections and tariff setting

In both Atebubu and Bekwai, the operators have ensured in 2005, 2006 and 2007 that all customers are metered. In Bekwai, the metering of households is done in a distribution box on the secondary distribution lines such that any tapping along any tertiary distribution line is measured by a meter. According to the operator, that arrangement makes illegal connections of little concern as all leakage along the tertiary lines are measured as consumption to the households on whose line somebody may have illegally connected. It has ensured also that it is customers who take responsibility to limit illegal connections. This arrangement however is not any innovative idea of the private operator, rather it is a function of the consultant's design.

5.3.3 Water tariff

Reiterating the tariff issues from the previous chapter, Figure 5.7 shows a plot of average tariff/m^3 against cost of water supply/m^3 for Atebubu and Bekwai in 2005, 2006 and 2007.

Figure 5.7 shows that whilst Bekwai in 2005 and 2006 recorded average tariff slightly higher than cost of supply but recorded a higher supply cost than the average tariff in 2007, Atebubu in all three years recorded average tariffs significantly lower than the supply cost. In 2005, 2006 and 2007, Atebubu only recorded respectively average tariffs equivalent to 73%, 56% and 63% of the supply cost despite the higher average tariffs recorded in all three years relative to the average tariffs in Bekwai. The situation in Atebubu is another pointer that as long as the system relies on the two diesel engines as their source of power, the operating expenses will continue to be high. But the extension of electricity from the national grid to the pumping station is the responsibility of the District assembly and not until this is done can any operator provide sustainable services.

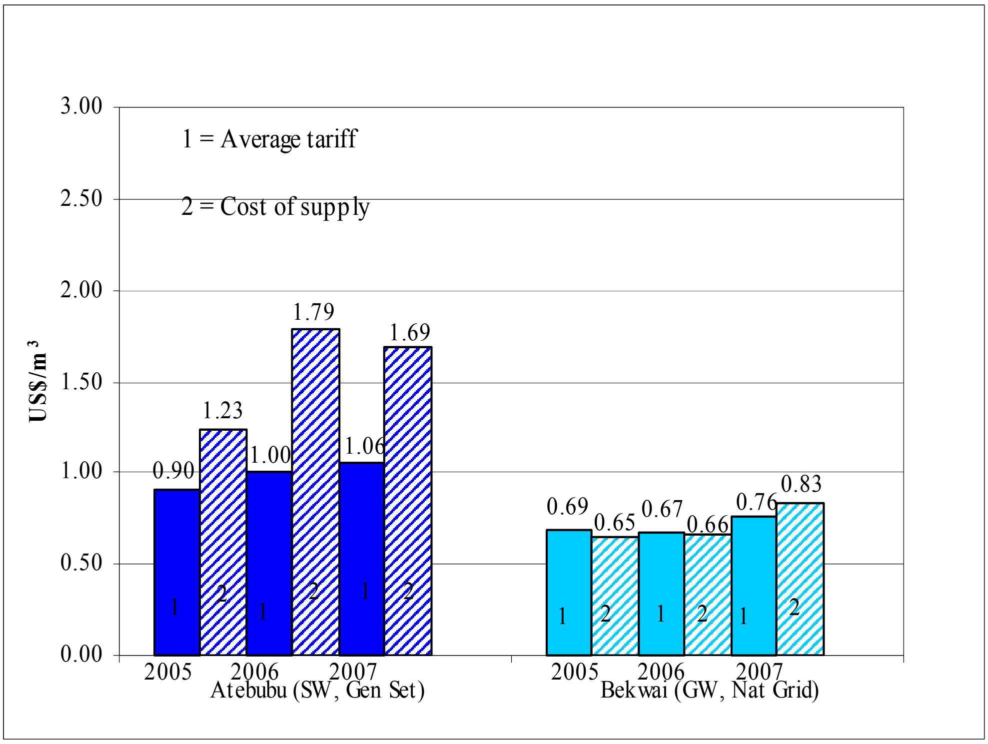

Figure 5.7 Average tariff against calculated cost of supplying water

Using the conventional operating ratio to assess the financial viability of the two systems, Figure 5.8 shows again that Bekwai for the three years recorded operating revenues above their operating expenses while revenues of Atebubu are unable to cover their operating expenses. This explains why the WSDB members of Atebubu said for sometime they have gone to the District Assembly to take loans for the operator in order to fix broken down equipment.

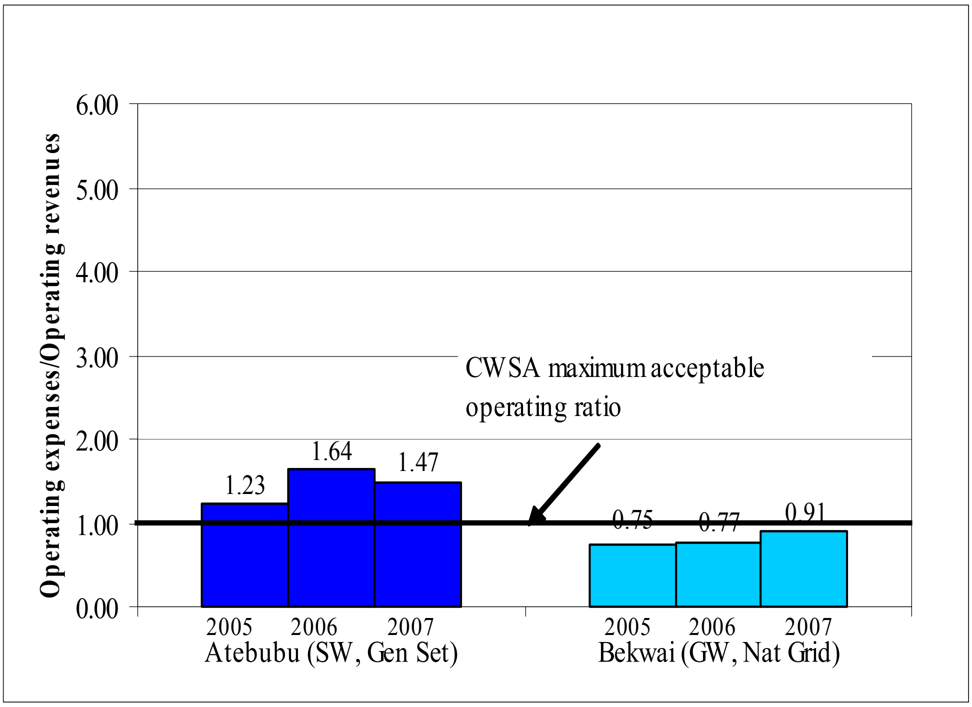

Figure 5.8 Operating ratios of Atebubu and Bekwai

The accumulated funds in the replacement accounts of the two water systems are shown in Table 5.2. The contracts signed between the WSDBs of Atebubu and Bekwai on one hand, and the two operators on the other hand, required that 75% of all water sales should be retained by the private operators for their operations. The remaining 25% of the tariff collected is to be paid back to the WSDBs and the District Assemblies as follows: 10% to WSDBs for their activities and for sanitation projects and 15% to the District Assembly to be paid to the replacement account. Table 5.2 shows that the operator in Atebubu in 2005, 2006 and 2007 only managed to deposit in the replacement account respectively 25%, 19% and 14% of the estimated accumulated depreciation amounts. The decline in the percentage of the amounts is because since 2005 no contributions were made into the fund.

Table 5.2 Accumulated funds in the Replacement Accounts of Atebubu and Bekwai water systems

Town	Year of commencement of water project	Accumulated funds (US$) as at 31st Dec. 2005	Estimated accumulated depreciation (US$) 2005	Accumulated funds (US$) as at 31st Dec. 2006	Estimated accumulated depreciation (US$) 2006	Accumulated funds (US$) as at 31st Dec. 2007	Estimated accumulated depreciation (US$) 2007
Atebubu	2002	6,516.11	25,581.66	6,457.17	34,628.93	6,303.51	43,972.82
Bekwai	2002	38,468.28	57,595.11	51,642.31	77,485.84	61,946.64	97,645.60

The operator in Bekwai was able make payments towards the replacement account equivalent to 67%, 67% and 63% of the estimated cumulative depreciation in 2005, 2006 and 2007 respectively. Although Bekwai has shown relatively better performance generating more funds for capital maintenance the amounts are still lower than required and the town will have to be supported to renew the system after its useful life.

The challenge is to ascertain whether or not these payments discussed are indeed reflecting in the replacement accounts as in Bekwai a legal battle ensued between the District Assembly and the WSDB when the latter attempted to ascertain from the former whether the amount is indeed in the replacement account. In order to ward off the WSDB the District Assembly in response immediately dissolved the entire WSDB. The WSDB is challenging the decision of the District Assembly in the Kumasi High Court as at 2008. This lack of transparency is a threat to sustainable water supply delivery and another indication of the weak accountability measures within the institutional framework of small towns water delivery which interestingly does not actually involve the private operator.

In the contract documents for the private operations of both the Atebubu and Bekwai water systems a tariff adjustment formula is provided which considers only inflationary effects on the operations of the water systems. In Ghana the water supply industry is, in addition to fluctuating inflation, affected by annual depreciation of the national currency. This is an important concern because while tariffs are charged in Cedis, spare parts and chemicals are imported in foreign currencies.

The tariff adjustment formula is:

$$P_m = P_o\,[0.2 + (0.2E_m/E_o) + (0.4W_m/W_o) + (0.2F_m/F_o)]$$

Where:

P_m = revised tariff for the year under consideration

P_o = tariff of the previous year

E_m = price of kWh of electricity for the domestic consumer for the year under consideration

E_o = price of kWh of electricity for the domestic consumer for the previous year

W_m = Daily minimum wage for year under consideration

W_o = Daily minimum wage for the previous year

F_m = price of a gallon of diesel for the year under consideration

F_o = price of a gallon of diesel for the previous year

Again the tariff at standpipes and tariff at house connections is compared to determine whether or not there is equity in the tariffs the different user groups pay in Atebubu and Bekwai.

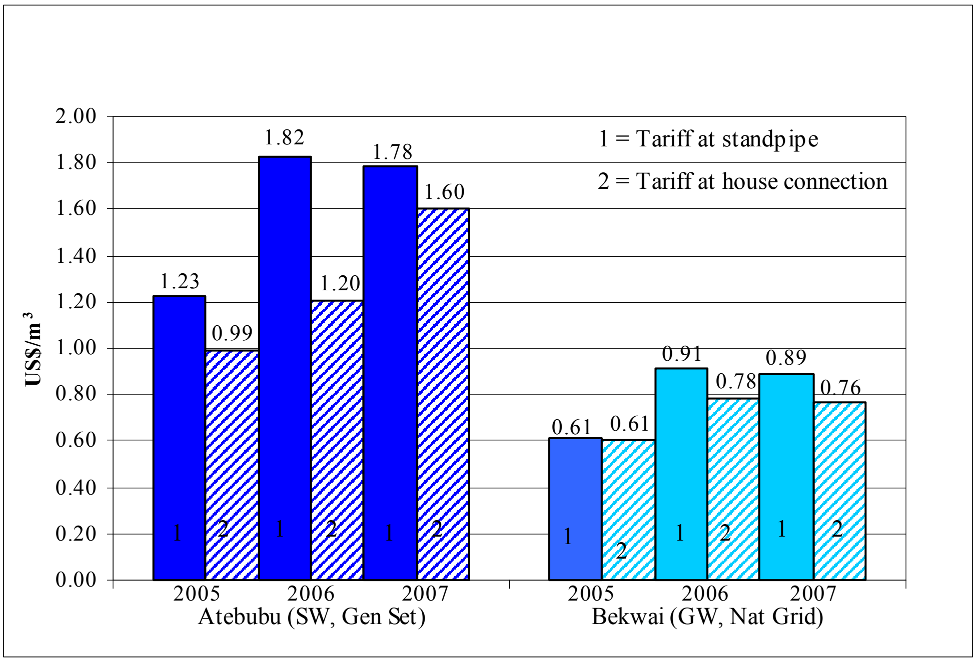

Figure 5.9 Water tariff charged at stand pipe and at household connections in US$/m^3

The CWSA guidelines for tariff setting presume that those without house connection and mostly patronise the standpipes are usually the poor in the towns (claim to be tested in chapter seven) and so those with house connections must be made to subsidise the poor who resort to standpipes. Figure 5.9 shows that in reality the reverse is true where the ‘supposedly poor’ who use the standpipes are made to subsidise the rich with house connections in both towns. This situation could be because in small towns the principle of ‘pay as you fetch’ is adopted at the standpipes which presents the operators with a regular and welcome flow of funds.

5.3.4 Bill collection

In analysing the bill collection efficiencies, it appears that Bekwai, over the three years, is showing decreasing efforts in getting customers to pay their bills.

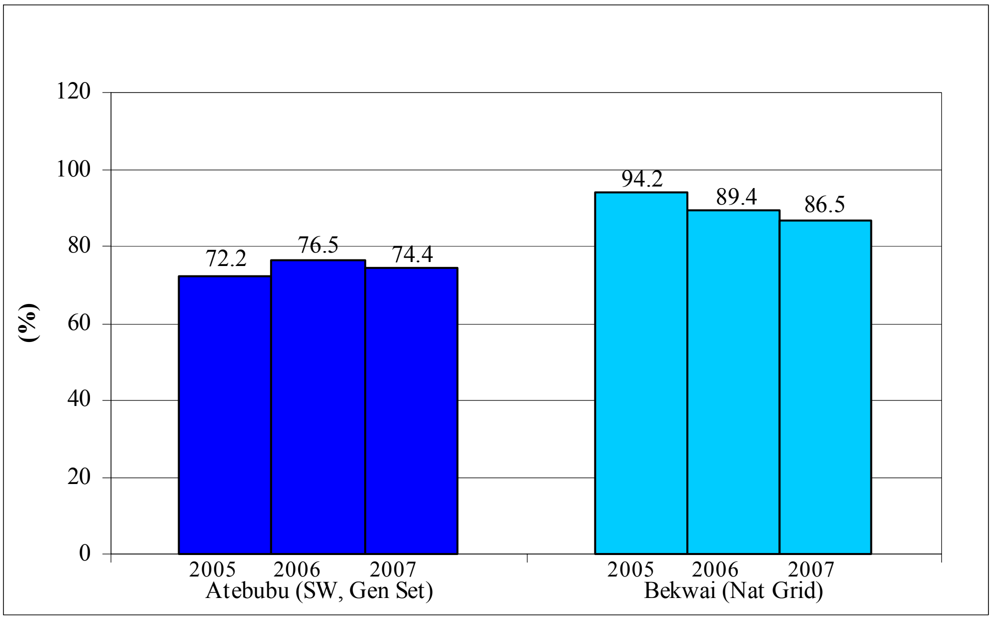

Figure 5.10 Bill collection efficiencies for Atebubu and Bekwai

5.3.5 Investments and revenues

In both Atebubu and Bekwai the per capita investments are less than the average construction cost of providing a water supply system with only standpipes. As cited in Chapter Four, WHO/UNICEF (2000) reports that the average cost per capita for a standpipe is US$ 31 while that for house connection is US$102 in the Africa Region, indicating a modest investment per capita in both Atebubu and Bekwai. The analysis of Figure 5.11 shows that in highly populated small towns, increased coverage of water supply services results in lower investment/person which is important in ensuring long term sustainability of the expensive investments.

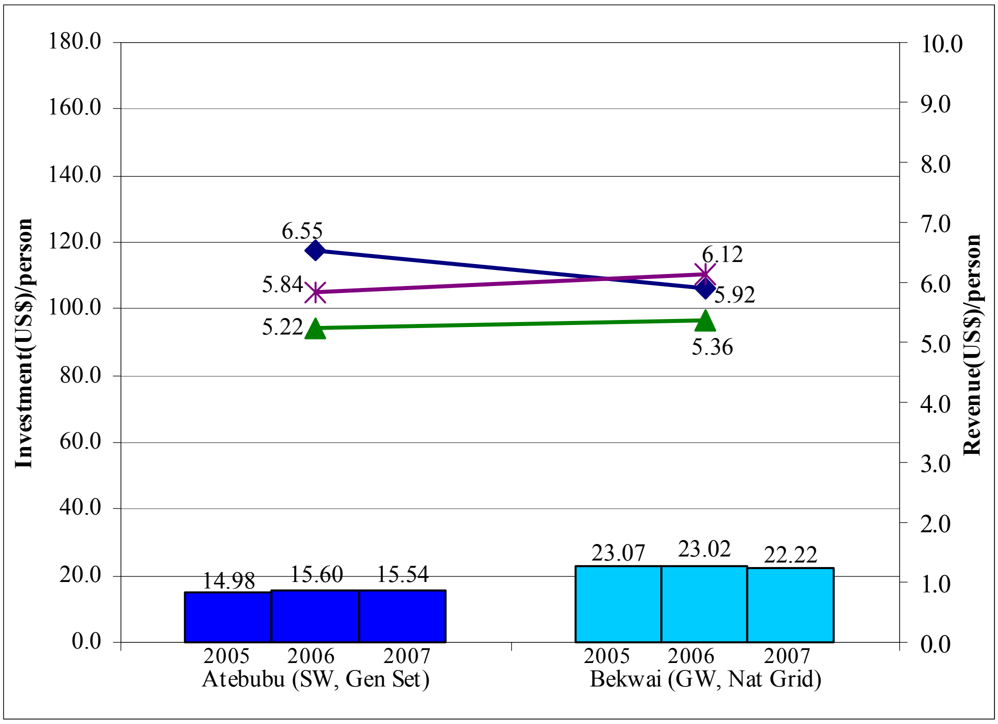

Figure 5.11 Investment/person against revenue/person in Atebubu and Bekwai

5.4 Human resources and organisation

5.4.1 Staff productivity index

Figure 5.12 shows that in Bekwai the staff productivity index is well below 1.0 per 1,000 persons served, with continued improvement every year whilst Atebubu recorded staff productivity index above 1.0 with a mixed trend. In Chapter Four it was suggested that based on the CWSA guideline for number of staff, a staff productivity of 0.5 or less is considered a reasonable target. In Atebubu the WSDB indicated their resolve to ensure that the operator reduces its staff strength of 12 provided for by the contract to 8 in order to reduce operational cost. This will go a long way to improve the staff productivity index. At the moment Atebubu has 14 full time staff and Bekwai has 10. The suggestion by the WSDB would have improved the staff productivity of Atebubu to 0.7, 0.68 and 0.66 respectively in 2005, 2006 and 2007.

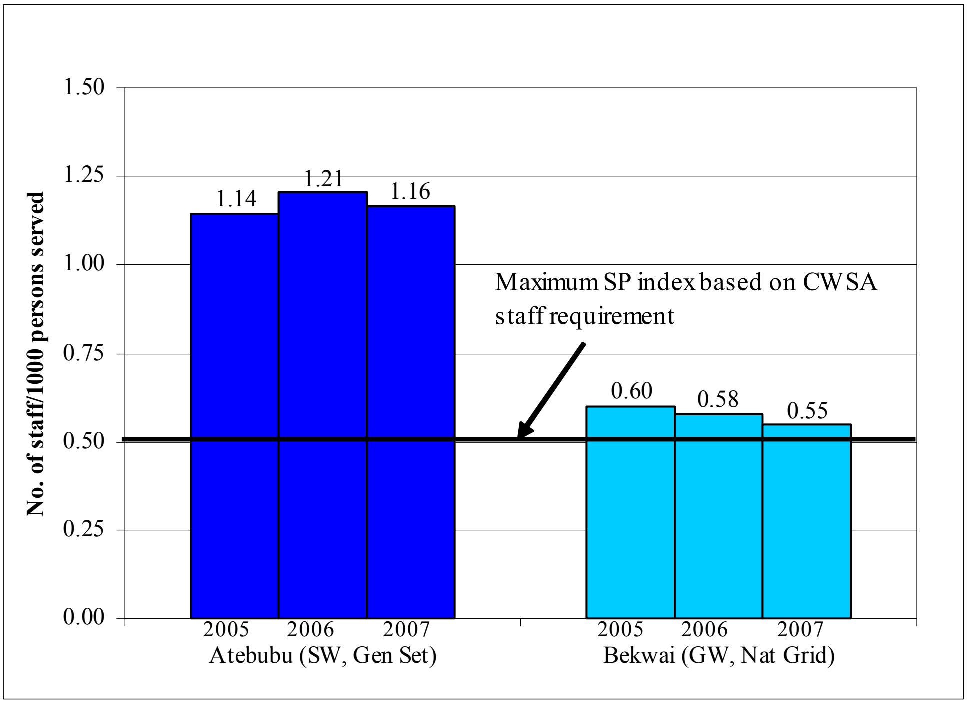

Figure 5.12 Staff/1000 persons served for Atebubu and Bekwai water systems

5.4.2 Staff qualifications

Following again the CWSA Small Towns Sector Policy for the three key staff, a score of 9 is expected as discussed in Chapter Four. In both Atebubu and Bekwai, the staff of the operators have been with the companies since the inception of the water projects in 2002. In scoring the three key staff, Atebubu scored 80% and Bekwai scored 83%. The closeness of the scores of the two operators, when viewed within the vast differences in performance, shows that higher education alone does not necessarily lead to successful management of water supply systems.

In the assessment of the performance of the two private operator-managed water supply systems, in addition to the staff qualification, the work history of the employees of the private companies are vital. The staff of Armco Limited, the operator of the Atebubu water system, are former employees of the state owned Ghana Water Company Limited (GWCL) with working experiences ranging from 5 to 38 years. The water supply system is therefore, not surprisingly, being managed like a ‘mini GWCL’ rather than as a private operator, as the system manager during interview constantly referred what they do at Armco to what they used to do at GWCL. The staff of Vicco Ventures, the operator in Bekwai, have been with the company from when it was responsible for design and construction of small towns water supply systems. The staff therefore have had no fore knowledge of operations of small towns water supply systems before taking up the operation and management contract but the orientation of the staff is worth noting. Box 5.3 sums up the differences that exist between the staff of Armco and Vicco Ventures from the following comments.

Box 5.3
"GWCL could perform better in small towns than a private operator since GWCL runs many systems, they could take revenue generated from the richer towns to help maintain the systems in the poorer towns" (System Manager, Atebubu)

"Our profit is the driver of our performance" (Accountant/Administrative officer, Bekwai)

5.4.3 Subjective capacity descriptors

As in the previous explanation of subjective capacity descriptors, Figure 5.13 shows that both operators (Atebubu and Bekwai) recorded their best scores in organisational autonomy which should translate into better performance. However, towards the end of 2007 when the operator in Atebubu proposed an increase in their water tariff, the District Assembly strongly resisted the idea and the result of the misunderstanding is non-renewal of the operator's contract after it ended in 2007. The WSDB which supported the stand of the operator has been dissolved. The relationship between the staff of the Bekwai system and the manager is very cordial and the manager by trusting them delegates his immediate Assistant to take charge of the operations while he is away. There is also exemplary leadership by the operator by installing a meter on their own office premises to measure their own consumption which is paid for every month.

As discussed earlier in the chapter, the District Assembly has dissolved the WSDB for attempting to find out whether moneys paid to the Assembly by the operator to be paid into the capital maintenance accounts has indeed been paid. The WSDBs in both Atebubu and Bekwai cannot be said to be enjoying the level of autonomy being enjoyed by the private operators by the two Assemblies. In Atebubu consumers look to the District Assembly to help solve their water problems but in Bekwai consumers look to the operator for solution to their water problems. The operator in Bekwai is therefore more trusted by the consumers. In all descriptors, Bekwai performed better, scoring on the average above 3.5, while Atebubu, from the researcher's judgement scored less than 2.0.

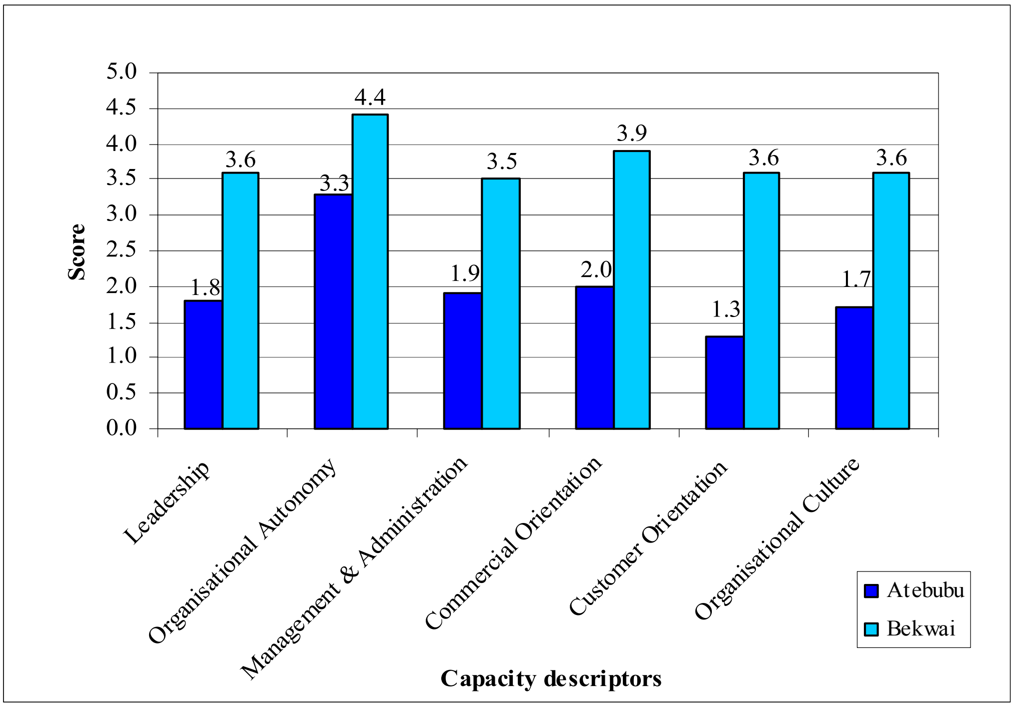

Figure 5.13 Subjective capacity of Atebubu and Bekwai

Data collected and analysed based on Cullivan, et al (1988) and Franceys (2006) descriptors.

5.5 Chapter summary

In summary, the idea that the involvement of private operators in managing small towns water supply will presumably ensure better performance by improving efficiencies and reducing political interference has been shown to be not wholly right as illustrated by the limited performance of Atebubu in almost all the performance indicators assessed.

The need for water treatment and remote use of generator sets in Atebubu is the major reason for the high operating costs and high breakdown times being recorded by the operator. Where pumping equipment is not connected to the national electricity grid any operator contracted may be unable to provide quality service to the consumers in Atebubu. But connection of the treatment plant to the national electricity grid will need the support of the District Assembly if it is to be achieved, emphasising need for some target support to operators.

Overall, between the two private operators, Bekwai performed significantly better and the performance of Atebubu, as discussed in the chapter, does not even compare to the performance of Asiakwa, one of the community managed systems discussed in Chapter Four. The performance of Atebubu shows that the private operator management model on its own does not necessarily deliver quality service. In both Atebubu and Bekwai the operators retain 75% of water sales but this profit incentive has not motivated the private operator in Atebubu to improve services and it can be concluded that the operator in Atebubu does not show any qualities of a private operator and therefore perhaps should not be referred to as such.

The analysis of the data in terms of the three years of records has not shown any significant trends over the three years.

The final management model to consider in the following chapter is public utility management of small towns water which is the last of the management models investigated.

CHAPTER SIX

6 Performance of public utility managed water supply systems in small towns in Ghana

6.1 Introduction

The National Community Water and Sanitation Programme (NCWSP) which decoupled the management of rural and small towns water supply from the urban water supply was to ensure management of small towns water supply by communities themselves with support from the District Assemblies. This was inspired by the sector professionals' attempt to redefine the water supply sector in terms of "community and utility managed systems" (World Bank, 1994).

In this chapter the performance of two of the small towns water supply systems retained by the national utility, GWSC, under its own management after the 1994 reforms, is discussed. The two towns considered in this case study are Apam in the Central Region and Sogakope in the Volta Region. The public utility management model operates on the principle of a deconcentrated organisation, where decisions are taken at the headquarters in Accra, the national capital and the operators at towns and cities only implement those decisions. Public utility managed systems have the unique advantage of having access to qualified staff with a reasonable level of job security which should translate to effective service delivery and in this chapter this unique quality of the management model will be looked for among the two operators. Another important quality of the public utility managed systems is the cross subsidisation of poorly performing systems as all systems operate the same accounts from which funds are made available for operations.

The implementation of the National Community Water and Sanitation Project was undertaken because the public water utility provider, Ghana Water and Sewerage Corporation, was observed to have challenges in adequately managing rural and small towns water supplies in addition to the main urban centres water supply. The GWSC transferred a total of 120 small town water supply systems to the various District

Assemblies, retaining some rehabilitated systems under their management (Manu, 2001) against the NCWSP objectives. It should be noted that both GWSC and CWSA till date do not know the actual number of small towns systems that needed to have been transferred and any estimated number is based on what officials can easily remember.

Water supply delivery in small towns by the public water utility does not follow the National Community Water and Sanitation Project process of using the decentralised local government system in Ghana. The District Assemblies in small towns where the public utility manages their water supply systems do not play any role which contravenes the both the National Constitution and the Local Government Law which places responsibility of all development on the District Assemblies. The communities are also not involved in the decisions of the water system either.

Under the public utility managed model in small towns, Ghana Water Company Limited (formerly GWSC) owns all the assets of the water supply systems and recruits their operational staff by competitive interviews at the Regional offices. The government of Ghana guarantees loans for any rehabilitation of existing systems and unlike the towns under community or private operator managed systems, the beneficiary communities do not make any contributions towards the capital investments. Tariffs charged for water consumption by the public utility are the same per unit charge approved by the Public Utilities Regulatory Commission (PURC) which is implemented in the large urban towns, thereby presumably subsidising small towns supply yet further. The urban tariffs in Ghana has a 2% component meant to be used for the development of rural water supply (small towns included) the payment of which is faced with difficulty as a result of the revenue challenges of the public utility provider (Braimah and Franceys, 2009).

Monitoring of the public utility managed small towns water systems are the responsibilities of the Regional Offices and these specific cases of Apam and Sogakope they are the Central Regional and Volta Regional offices respectively. Monthly operational and financial reports are therefore submitted to these regional offices copies of which were made available to this author.

6.1.1 Case studies context

The current distribution system of Apam water was constructed in 1967 and the town has depended solely on the system without rehabilitation until 2007 when bulk water for the system was supplied by the Winneba water supply system after its construction in 2003. The Sogakope water system on the other hand was constructed in 1998. The Apam water supply system, in addition to serving water to the main township, supplies water to three other communities along the main pipeline transporting water from the treatment plant. The Sogakope water supply system, in addition to supplying water to the Sogakope township, supplies water to 53 other rural communities within the South Tongu District. Some of these communities supplied by the Sogakope water system, depend on one standpipe with double outlets.

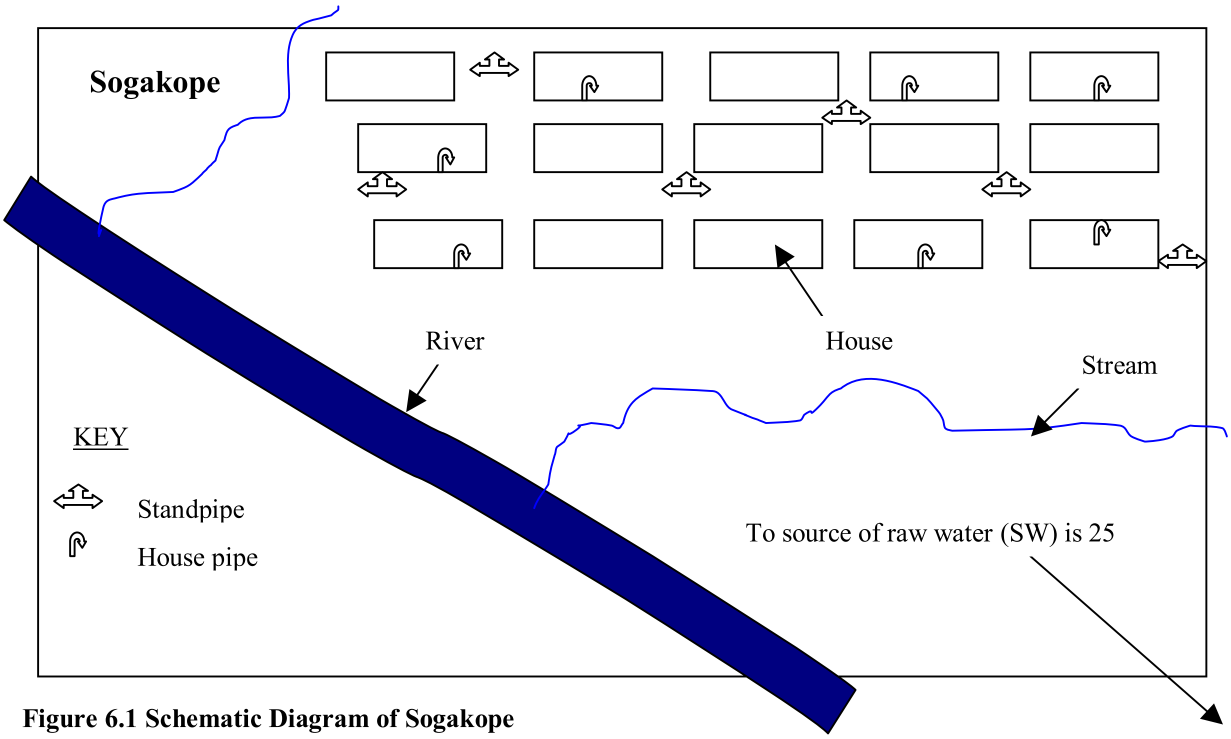

Figure 6.1 Schematic Diagram of Sogakope

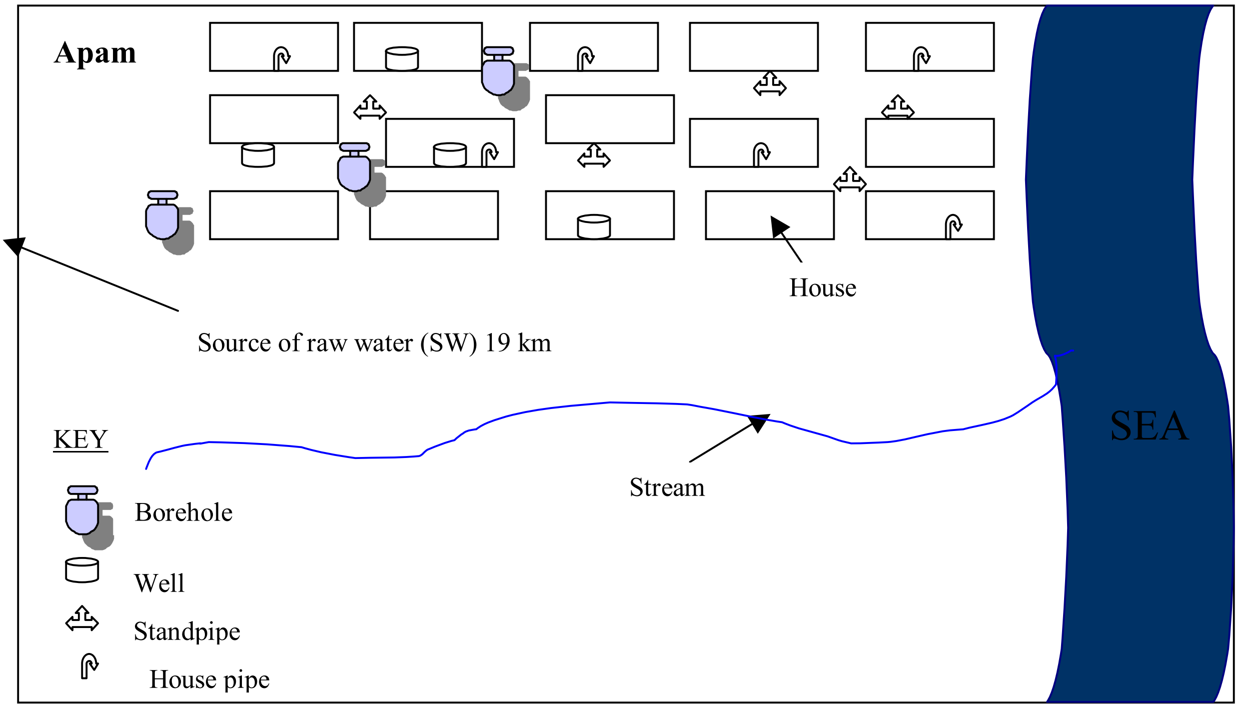

Figure 6.2 Schematic Diagram of Apam

By regional averages, the per capita income for the Central Region where Apam is located is US$425.79 and that of the Volta Region where Sogakope is located is US$249.60 (GSS, 2008) which compares to the household survey figures shown in Table 6.1. Apam and Sogakope are the district capitals of their respective district assemblies.

The climatic condition of both Apam and Sogakope is described as the Coastal Savannah and both towns experience two rainy seasons and one dry season. In each of the towns there exist multiple alternative sources of water which are free for use by customers. Again, household water consumption is drawn from among these different sources according to use.

The table below shows the context information on each town water system that could affect the overall performance of the water system discussed later in the chapter.

Table 6.1 Context information for the public utility managed water supply towns

Context Information		Apam	Sogakope
*Projected population with operational area (2008)		36,349	51,517
*Population growth rate (%)		1.3	3.4
Average household size		5.5 (0.412) (1 – 16)	5.5 (0.600) (1 – 11)
Average per capita income($/annum)		582.40(83.43) (44.44 – 2416.67)	352.58(40.00) (114.58 – 720.00)
Number of household connections	2005 2006 2007	710 730 784	857 872 869
Number of stand pipes	2005 2006 2007	37 38 46	147 149 163
Source of raw water used by operators		SW	SW
Source of power		National grid	National grid
Topography		Fairly flat	Fairly flat
**Average annual Rainfall (mm)		800	730
Year of commencement of project		1967	1998

The figures in parenthesis represent the standard error of the mean and the minimum and maximum figures recorded. *Source: 2000 Population and housing census. ** Source: http://ghanadistricts.com (accessed 15/08/09). Note: GW = Ground water and SW = Surface Water.

6.2 Level of services provided by operation

6.2.1 Service coverage

As shown in Table 6.1, both household connections and the public standpipes which serve the people have been increasing from year to year. As the GWCL does not have a specified number of customers expected to be served by a single standpipe, the CWSA designed estimate of 300 people is used in the analysis.

In both Apam and Sogakope more customers are theoretically served by the public standpipes and in Apam, from one year to another, coverage figures increased for both standpipes and house connections. In Sogakope, coverage by house connection was in decline from one year to another indicating a faster growing population than increases recorded in annual house connections.

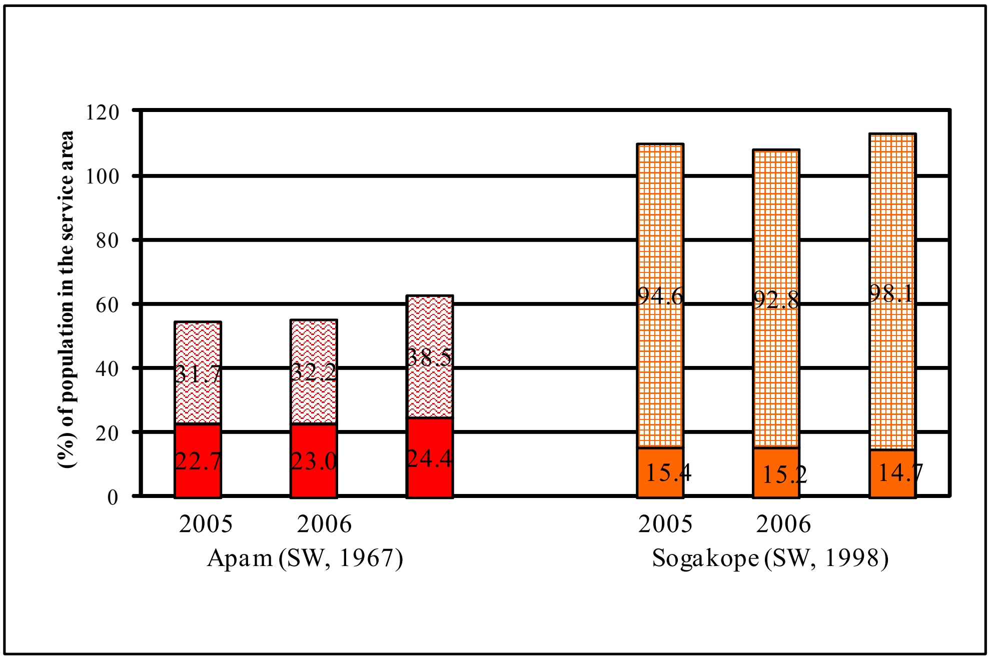

Figure 6.3 Percentage of towns population served by household connections and public standpipes

Note: Lower charts represent coverage by house connections and upper charts represent coverage by stand pipes.

In Apam as shown in Figure 6.3, the water supply systems is unable to provide 100% coverage and expansion is therefore required to achieve full coverage. Sogakope on the other hand is showing more than 100% coverage in all three years as a result of the large numbers of the public standpipes serving some of the smaller communities in addition to those in Sogakope township. A higher proportion of the town's population in Apam depends on house connection than Sogakope.

The theoretical coverage figures recorded for Apam confirms households' dependency on different sources of water, discussed further in Chapter Seven, whereas in Sogakope, in both rainy and dry seasons, all the households surveyed depend on the piped water system as their main source of water.

6.2.2 Breakdown time

The breakdown time is a function of faults, perhaps influenced by the age of the systems, as well as the availability of funds to pay for the repairs and mechanics to be hired. Unlike the CWSA systems which depend on mechanics from the open market to resolve their breakdown problems, Apam and Sogakope depend on the mechanics of the public utility based in the regional capitals, Cape Coast and Ho respectively. Therefore any long breakdown times are not due to lack of mechanics. The CWSA measure of a reliable water supply service of breakdown not more than 5% of all the days in a year is adopted for these two public utility managed systems to make it possible for comparison to be made with the NCWSP systems.

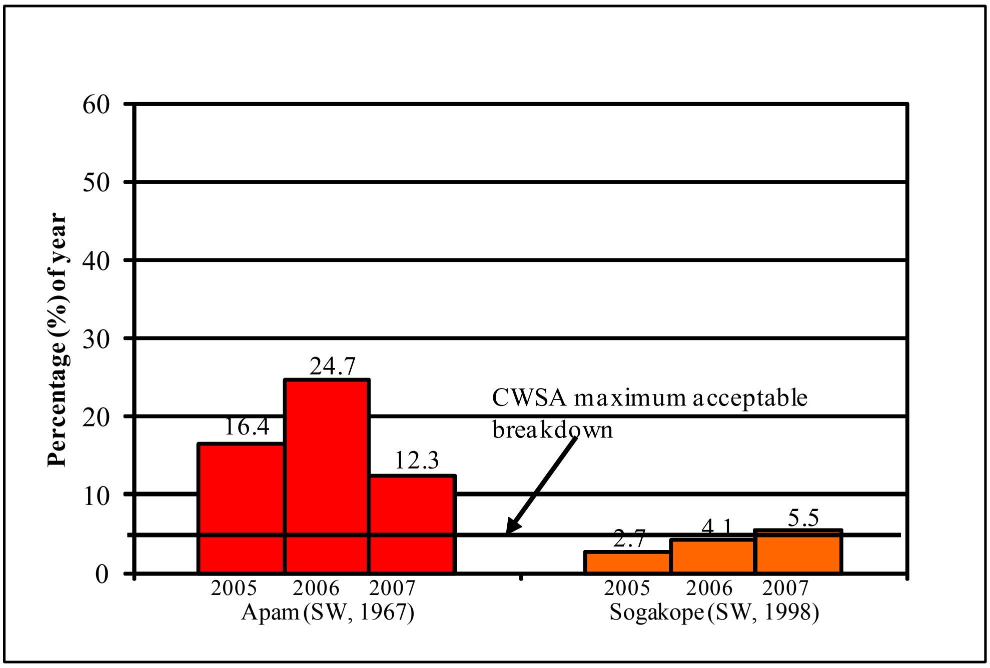

Figure 6.4 Percentage of the year water supply systems breaks down

In Figure 6.4 Sogakope has for the three consecutive years of 2005, 2006 and 2007 shown increasing breakdown times due to aging of the system but was close enough to CWSA acceptable limits overall. The Apam water system which was due to have been rehabilitated after design and costing of the system had been carried out in 2004 is showing signs of continuous deterioration between 2005 and 2006 but with some improvement in 2007. In 2007 the pumping station of Apam based at Kwonyaku was shut down and it now receives bulk supply from the Winneba water system resulting in the improvement in 2007. The major cause of breakdown in Apam was the frequent breakdown at the pumping station and pipe bursts which cause significant leakage as the old metallic pipeline joints get rusted away by the intrusion of sea water into the land. The other reason could be attributed to the non-resident manager who lives in Winneba, about 25 km away from Apam and is also the full time District Manager of Winneba water system.

6.2.3 Water availability

In Apam, in all three years, customers with house connections receive 16 hours of water a day while those depending on standpipes receive 8 hours of water, being the time the vendors are operating the standpipes. In Sogakope customers with house connections enjoyed water supply for 18 hours a day in 2005 and 2006 and this improved to 20 hours a day in 2007 while in all three years standpipe customers enjoyed 10 hours a day of water flow. In both towns the operators are not delivering the water equitably as house connection users enjoyed longer hours of water availability than standpipe users.

6.2.4 Water consumption

Figure 6.5 below shows the per capita water consumption in Apam and Sogakope according to the operators records of water sold measured against the CWSA minimum per capita consumption level.

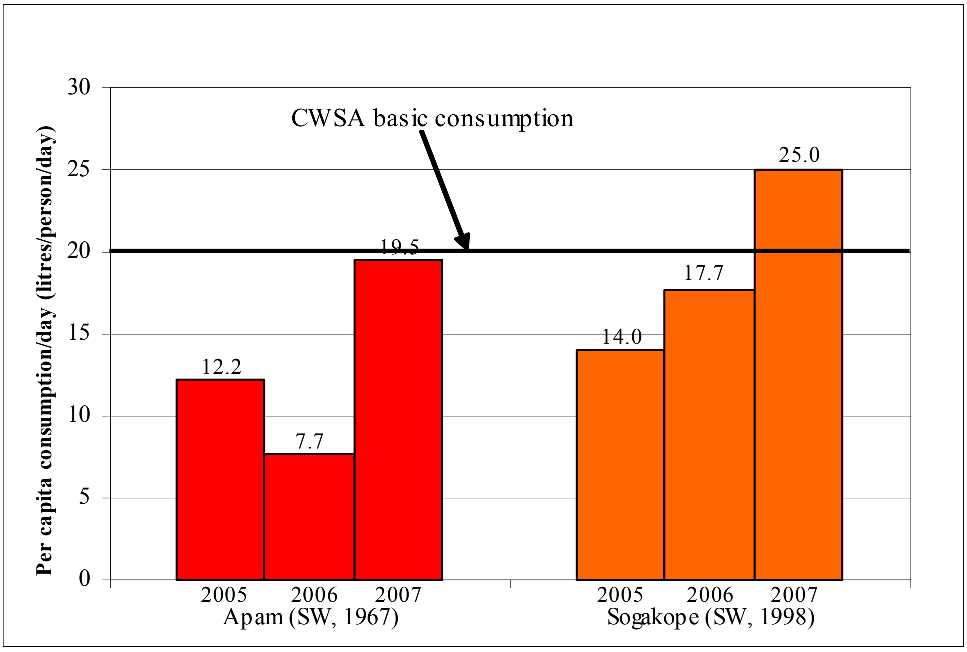

Figure 6.5 Per capita water consumption based on annual water sold by operators

In Apam, the per capita water supplied to customers reduced between 2005 and 2006 but increased by more than 153% in 2007 due to the new bulk supply received from the Winneba water system. In Sogakope customers were provided with water above the basic per capita supply in 2007 which was 41.2% more than that provided in 2006.

The Apam receipt of treated water from the Winneba system is an option worth exploring where one main pumping station supplies a number of small towns with bulk water for them to share the production cost. This is also the arrangement between Sogakope and Keta where one pumping station has been built to supply bulk water to the two towns with Sogakope receiving two thirds of production daily.

Figure 6.5 shows that in 2007 both Apam and Sogakope show improved performance. It must be noted that in 2007 the newly appointed national private management operator, Aqua Vittens Rand Limited (AVRL), was contracted to manage the public utility and was also moving into the small towns under their operation. The improved performance might have been influenced by the uncertainty surrounding staffing of the public utility company as staff did not know who was to be laid off and therefore there was a good incentive for everyone to perform their best. This indicates how strict monitoring and a performance based contract with staff in small towns water supply systems could contribute to improvements in performance, irrespective of models.

6.3 Economic and financial performance

6.3.1 Revenue losses as water loss

In Figure 6.6, none of the operators in any year is able to control unaccounted for water to the CWSA acceptable standard. In Apam the deterioration of the pipelines has resulted in the large amounts of unaccounted for water of more than 60% in 2006 and 2007, an indication of considerable loss of revenue and until the planned rehabilitation is carried out on the water supply network it will continue to record unacceptably high losses. The high pressure water, delivered to the pipelines from the Winneba headworks, is said to be contributing to the high leakage in the Apam system. Relative to the Apam system, Sogakope recorded lower unaccounted for water in 2006 and 2007.

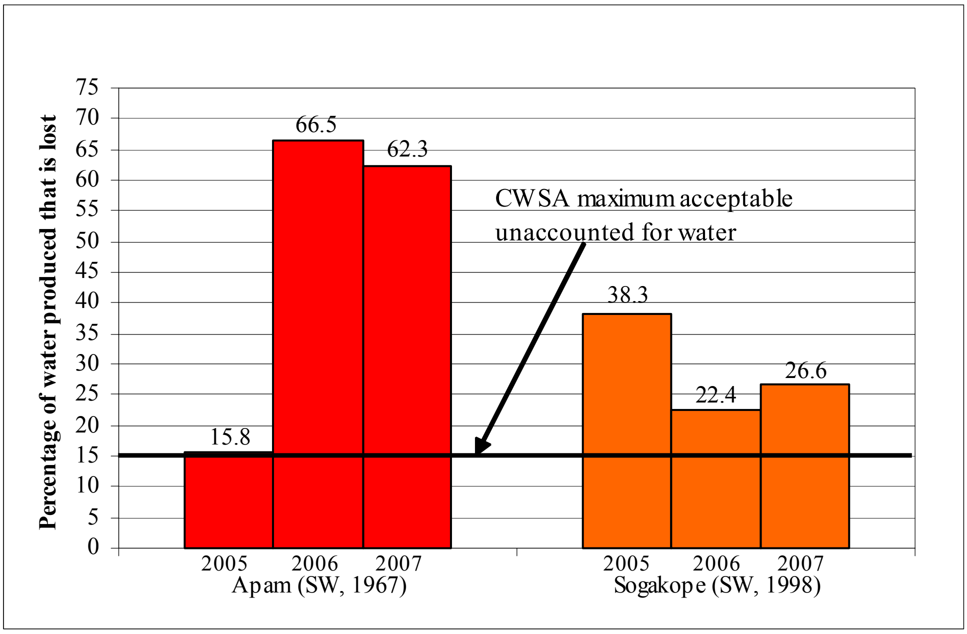

Figure 6.6 Percentage of water produced that is not accounted for annually

6.3.2 Metered connections and tariff setting

In Figure 6.7, while Sogakope water supply system is making an effort to attain 100% metering coverage between 2005 and 2007, Apam is only able to achieve its best metering coverage of about 30% in 2007. The proposal to rehabilitate the system in Apam which is yet to materialise could have been the disincentive to the operator to invest in new meters when they could be provided during rehabilitation. The District Manager of the Sogakope water system describes their efforts to get all customers metered and to service all their bulk water meters.

The metering level in Apam shows that the operator might not be charging fair tariffs as large portion of the customers pay flat rate another source of leakage of revenue needed for operational expenses.

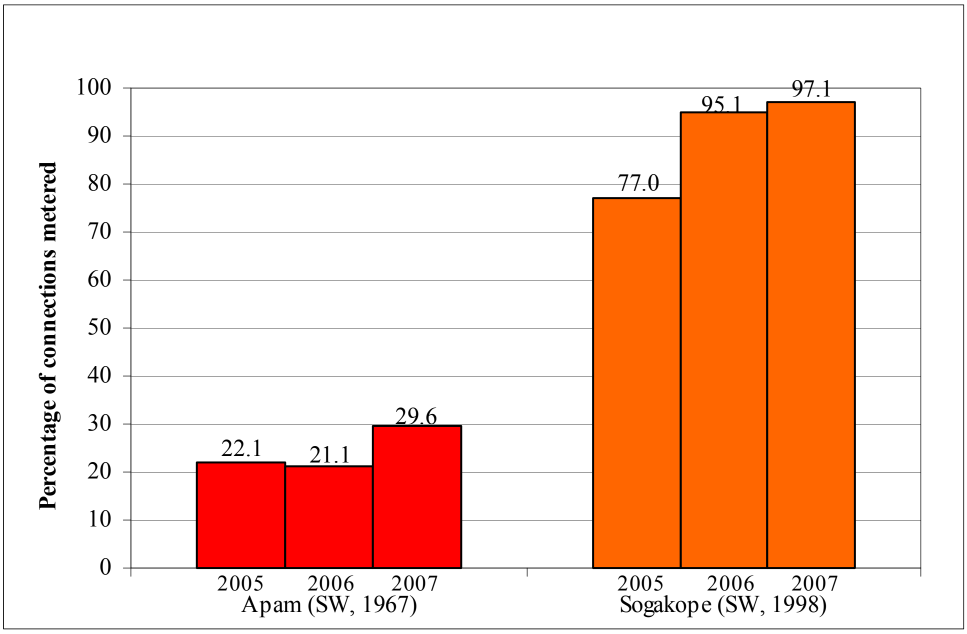

Figure 6.7 Percentage of all connections with operational meters

The differences the two public utility managed systems in terms of metering might be an indication that the public utility company does not have a strict rule on metering. It also shows that even under a centralised management model, differences still exist in how water supply systems are managed.

6.3.3 Water tariff

Figure 6.8 shows the plot of average tariff/m^3 against cost of water supply/m^3 for Apam and Sogakope water supply systems. As for the other small towns, according to officials at the headquarters of GWCL, all capital investments are borne by the government of Ghana and therefore the tariffs do not include any loan repayment and interest payments, even for the public utility managed systems.

In calculating the depreciation of the systems, again a 20 year working life is assumed. In collecting data on the Apam water system, there were no records on the investments of the water system carried out in 1967; therefore the researcher has had to rely on the estimates made for the proposed renewals of the system. All analyses that involve the investment cost are therefore dependent on this assumed figure, which represents the cost of the new system as at 2004, updated to 2008 prices.

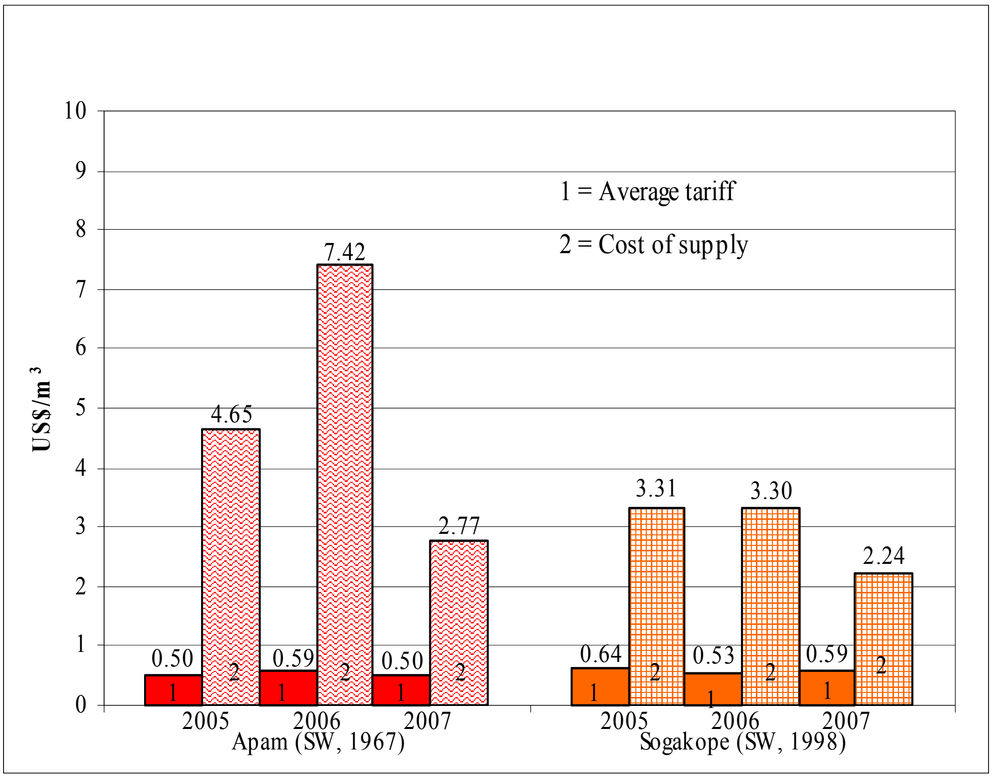

Figure 6.8 Average tariff against calculated cost of supplying water

Figure 6.8 shows that in each of the small towns, there are huge differences between the average tariffs and the cost of supplying water. For example in Apam, for 2005, 2006 and 2007, the average tariff for water represented respectively 10.8%, 8% and 18.1% of the supply costs. And in Sogakope, the average tariffs represent 19.3%, 16.1% and 26.3% of the supply cost. In Apam the frequent breakdowns of the water supply system in 2006 increased the operational cost of the system which adversely affected the supply cost in 2006. The two systems however have recorded similar average tariffs in all three years.

As a rule of thumb, Franceys (2006) suggest that an operating ratio of 0.8 (80%) is a reasonable estimate to ensure that provisions are made for capital maintenance (where not needing to make allowances for any cost of capital) for urban water utilities. However, as the tariff of the public water utility from the narration of an official of GWCL does not include loan repayment or interest payments a 60% is an appropriate measure. In Figure 6.9 below it is only in 2007 that Apam was able to raise revenue in excess of their operating expenses but in the previous two years the operating expenses were more than the revenues. Sogakope in 2005 and 2007 recorded expenditures more than twice the revenues generated in those years and in 2006 the operating expenditure was more than three times the revenues generated making the water supply system seem as if it was providing a social service rather than selling a 'demand responsive' product.

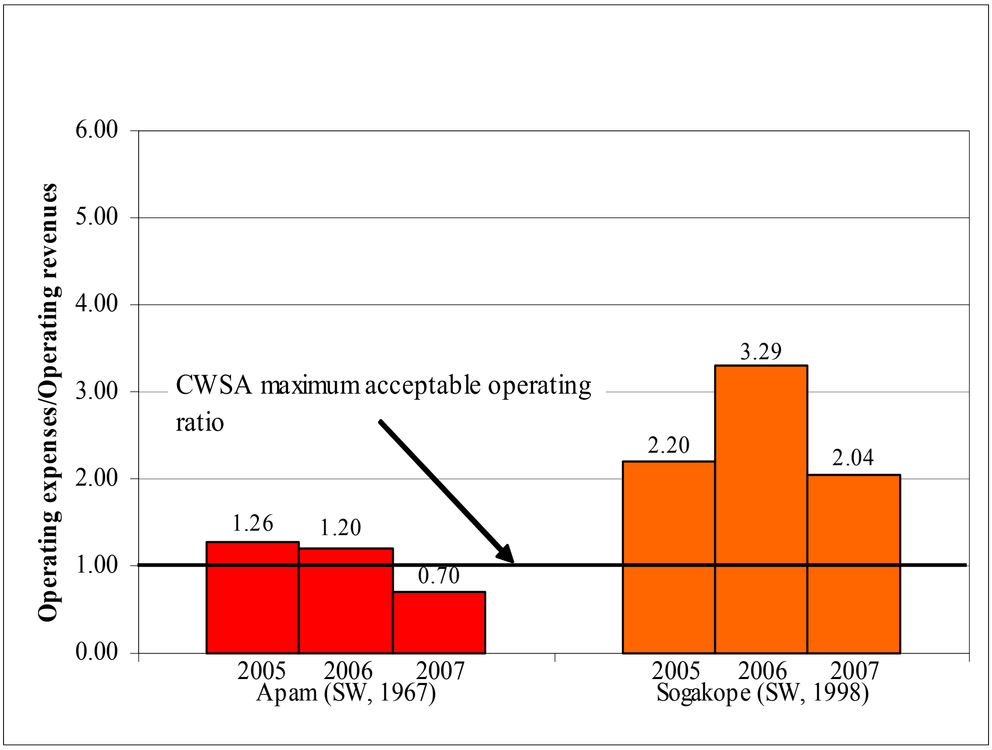

Figure 6.9 Operating ratios of Apam and Sogakope water systems

The analysis of the average tariffs and cost of supply for the Apam and Sogakope water supply systems show that without some kind of support from other sources the systems could not rely on their water sales for their operations. The Apam and Sogakope water systems do not need to bother about the financial challenges posed by the gap that exists between revenues and expenditures because all water supply systems under the public utility management put their revenues into one single account and from which funds are drawn for repairs and maintenance works. There is therefore a significant cross-subsidisation of poor performing water supply systems by well performing ones and this is one advantage that community managed and private operator managed system do not have.

In Figure 6.10, Sogakope, for the three years, charged a slightly higher tariff per cubic metre of water at standpipes than at the house connections but in Apam consumers using house connections pay more than those using standpipes. In 2007 the tariff increases offered by the public utility were utilised by the Sogakope water system, increasing both the standpipe and house connection tariffs but in Apam only those with house connection were charged the increased tariff. Again the different tariffs charged by the different operators adopting the same management model is yet another indication of the implementation differences which suggests that introduction of management models are not enough to cause the improved services desired. It re-emphasises how important monitoring and supervision and strict enforcement of rules are in small towns water supplies if performance improvements are to be achieved.

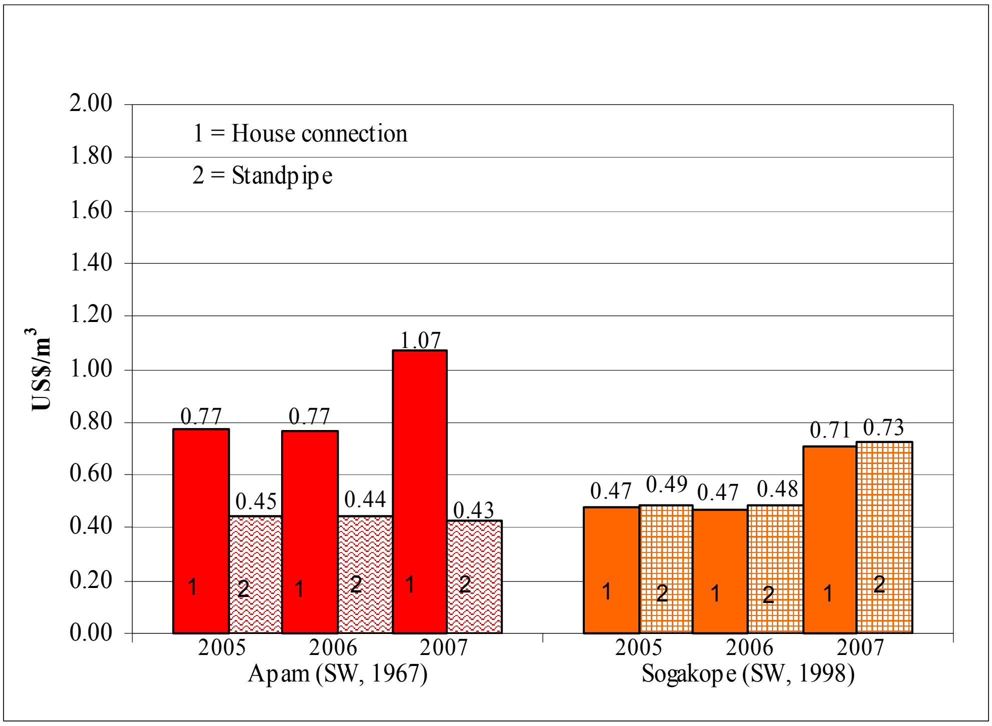

Figure 6.10 Water tariff charged at stand pipe and at household connections in US$/m^3

6.3.4 Bill collection

In each of the towns, collection of water charges at the standpipes are 100% as the principle of ‘pay as you fetch’ is strictly applied, with the vendors receiving commission on each payment made by consumers. In Apam the vendors receive 20% of all payments as commission and in Sogakope, the vendors receive the equivalent of 38.8% commission on all payments. The standard payment is usually the 20% but Sogakope required some extra incentive in order to get people to work as vendors.

As shown in Figure 6.11, the operator in Sogakope makes more effort to collect bills than the operator in Apam who shows decreasing collection efficiencies from 2005 to 2007. The two operators also face the challenges of collecting bills from government institutions but are relatively better positioned than the community managed and private operator managed system operators discussed in Chapter Four and Chapter Five. Payment by the Central Government through the Ministry of Finance for the government institutions is made directly to the GWCL headquarters in Accra. The challenge posed to CWSA of sorting out which small town's operator to issue what value of cheque to is therefore removed but the usual bureaucracies that characterise government establishments in Ghana still often delay these payments.

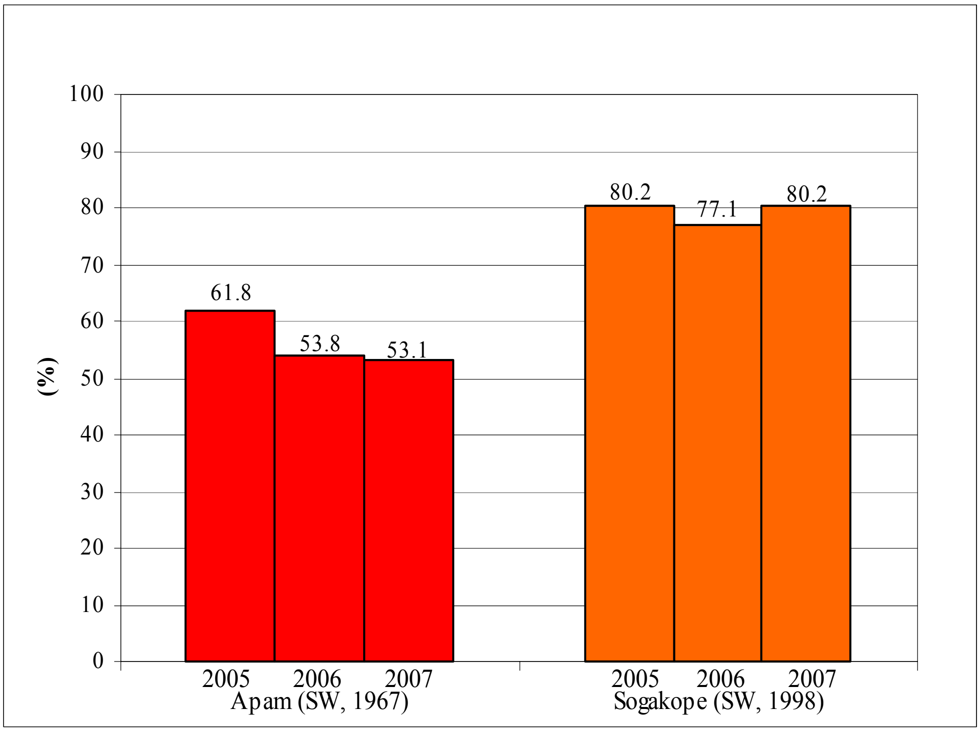

Figure 6.11 Bill collection efficiencies for Apam and Sogakope

6.3.5 Investments and revenues

As discussed earlier, the investment in all GWCL operated small towns do not require payment of any part of the capital investment. Even though it was originally assumed that tariffs charged for water consumption would include both capital maintenance, loan servicing and capital amortisation in reality government guarantees the loans and in most cases both the loan repayment and the payment of any interest on the loans are absorbed by central government.

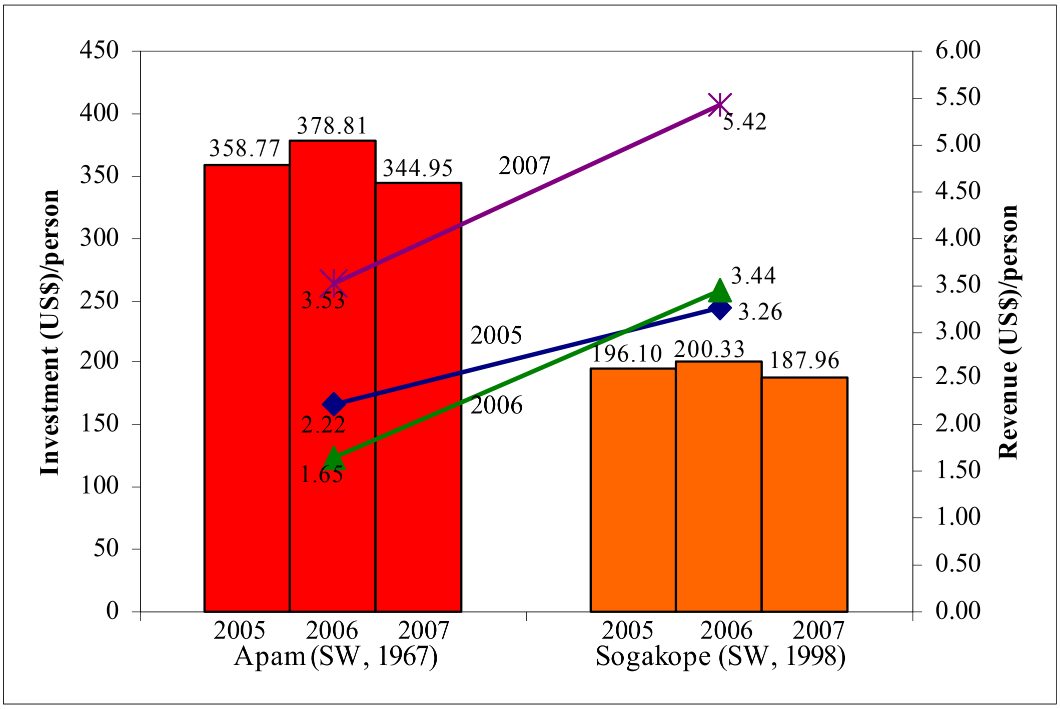

Figure 6.12 Investment/person against revenue/person in Apam and Sogakope

In both towns, as shown in Figure 6.12, there are huge differences between the investment/person and revenue/person. At those levels of revenues, there is no way the investments can be paid for within the lives of the systems. That means that the proposed rehabilitation of the Apam systems will provide another expensive system that the town cannot support from their current levels of tariff. The current per capita investment costs are far higher US$31 – US$102 recorded in the Africa Region (WHO/UNICEF, 2000). The analysis of Figure 6.12 shows that in order to obtain lower investment/person figures, an important ingredient for the long term sustainability of such expensive investments is to increase coverage of water supply services. This is an indication that economies of scale are an important requirement if small towns are to be managed sustainably. Perhaps it was not appropriate to disburse the GWSC small towns systems to a decentralised CWSA approach.

6.4 Human resources and organisation

6.4.1 Staff productivity index

Figure 6.13 below shows that both Apam and Sogakope in all three years recorded staff productivity indices below 0.5; less than 0.4 for the Apam system and less than 0.2 for the Sogakope system. This indicates that by the standard set for the analysis (less than one staff member per thousand people served), both water systems are efficiently using their staff but Sogakope is even more efficient than Apam.

As discussed already, the District and Commercial managers of the Winneba water system are responsible for the Apam water system as well as their other responsibilities with only a skeletal staff operating from Apam.

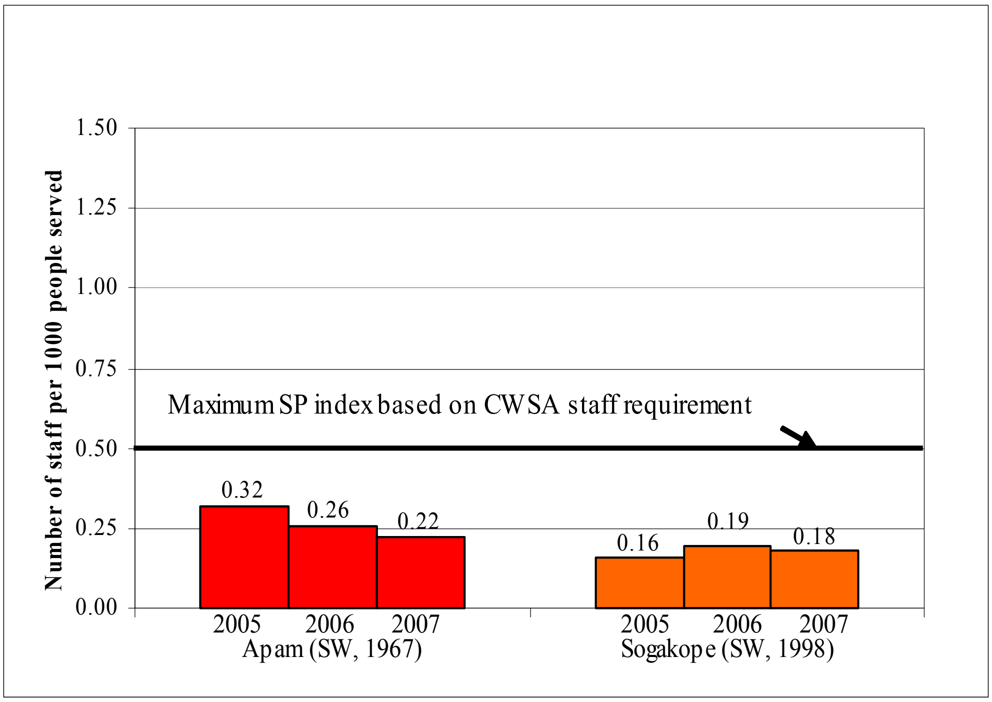

Figure 6.13 Staff/1000 people served by Apam and Sogakope water systems

The huge increase in water produced per staff member, Figure 6.14, between 2006 and 2007 in Apam was due to the system receiving bulk water from the fairly new Winneba water system for distribution.

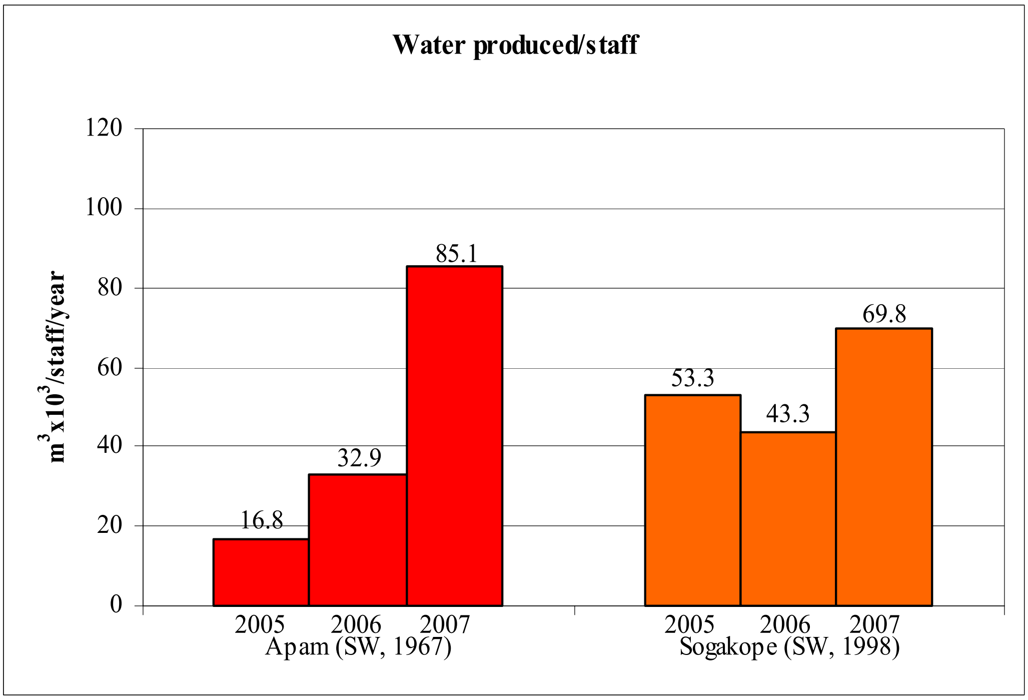

Figure 6.14 Volume of water produced, m^3x10^3 per staff per annum

6.4.2 Staff qualifications

In using the previously described staff qualifications scoring system, both Apam and Sogakope water supply systems scored 53.3%. As stated earlier in the chapter, two of the three key staff (District manager and Commercial manager) of the Apam system are permanent staff of the Winneba water system. The closeness of the scores of the two operators, when viewed within the huge differences in performance of the operators, again shows that higher education alone does not appear to make for successful management of water supply systems.

Training is vital in upgrading staff of the water systems, however. Until the management of the public utility company was contracted out to the Dutch – South African conglomerate, Aqua Vitens Rand Limited (AVRL) in 2006 the staff did not have access to training opportunities. In 2007 all the three key staff in both towns mentioned above attended some training programmes in Accra the national capital.

6.4.3 Subjective capacity descriptors

Using the capacity descriptor methodology, the researcher estimates that Sogakope is operating with a higher capacity than Apam in four descriptors with average scores only just above a worse than average 2.0 with similar scores in terms of organisational autonomy and consumer orientation. In terms of leadership, in Sogakope the District Manager plays a key role in motivating the other staff to improve their performances but because the District Manager in charge of the Apam water system is mostly in Winneba the is no such motivation as in Sogakope.

Both operators scored least in organisational autonomy as the researcher was made to believe from staff statements that key decisions about the operations of the water systems are taken either at the headquarters in Accra or the Regional Offices GWCL and they at the District level only implements those decisions.

On consumer orientation, none of the operators has discussed any issues of the water systems with their consumers and even tariff adjustments are not communicated to consumer in advance and consumers only see that on their bills. According to the operator in Sogakope any tariff increases are always announced in Accra and all radio and television stations cover that so their consumers get to know so there is no need to pre-inform them.

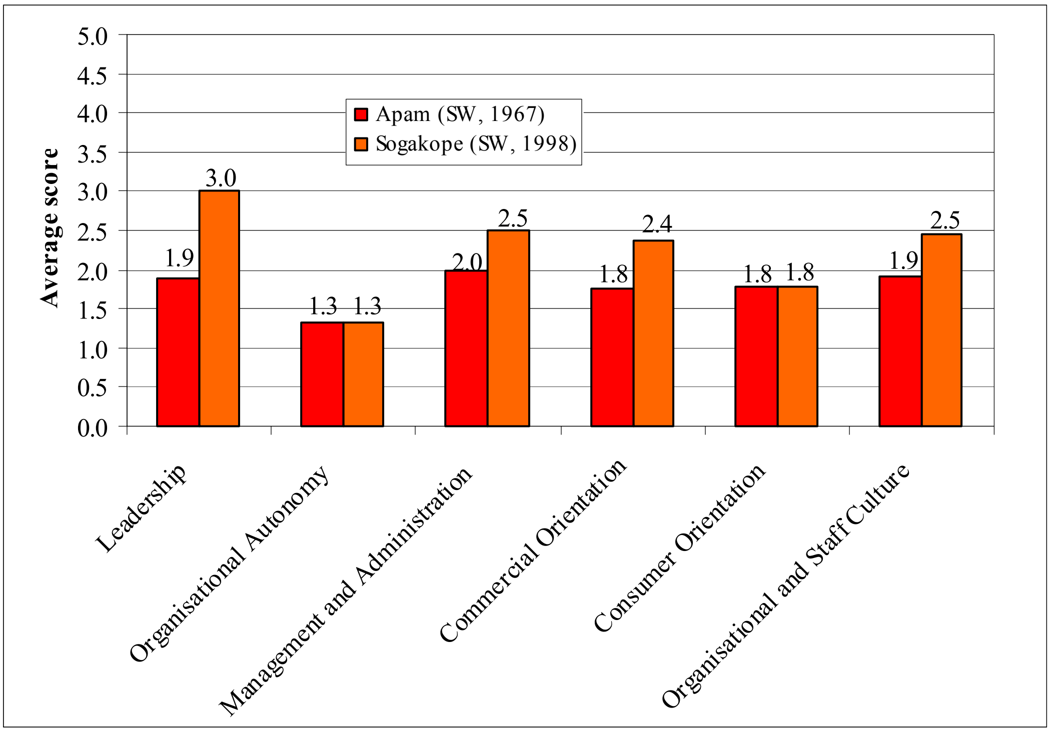

Figure 6.15 Subjective capacity of Apam and Sogakope

Data collected and analysed based on Cullivan, et al (1988) and Franceys (2006) descriptors.

6.5 Chapter summary

Under public utility management, small towns water systems benefit from the pool of technical experts at the various Regional offices of the utility and therefore do not need to go to the open market to hire mechanics to fix any breakdown. In both towns none of the consumer categories (house connections and standpipes) enjoy 24 hour water supply and since 2005 both systems have constantly been recording increased per capita water consumption by the consumers with both towns recording their highest figures in 2007.

In terms of economic and financial performance, despite the fact that there exist wide variations between the cost of water supply and revenues in both Apam and Sogakope, unaccounted for water is higher than 15% and bill collection efficiency below 85%. In Apam, consumers with house connections paid a higher tariff per cubic metre than standpipe consumers while in Sogakope standpipe consumers paid slightly high tariff per cubic metre of water. Even though there is an increased element of economies of scale relative to the other management models, none of the two water systems are sustainable in the long term because of the huge gaps between investments/person and revenues/person.

The differences in the tariff structure and vendors' commission in Apam and Sogakope have shown that there are implementation differences in decisions of the headquarters of the water company at the towns level due to differences in the interpretations of the rules. The chapter provided the opportunity to show that higher qualifications of operating staff do not necessarily translate into good performance of the water system.

In the chapter the availability of qualified staff and accessibility to funds for operations did not make the public utility managed systems effective but Sogakope is showing a relatively better performance than Apam.

In conclusion the public utility managed systems investigated are clearly not particularly effective, efficient or equitable and they are not being managed at all sustainably. The three years of data presented showed various trends in the operators' performances for which allowance will be made when comparing averages in the final discussion.

In the following chapter, the extent of effective demand for water supply services by consumers of small towns in Ghana is investigated. Having noted the influence of external donors on the management of the supply side of water it is necessary to investigate whether external advisors have been similarly ‘uneconomical with the truth’ with regard to demand. To what extent has the invention of new management models been a solution in search of a problem?

CHAPTER SEVEN

7 Households' demand for water supply services in small towns in Ghana

7.1 Introduction

In Chapters Four, Five and Six the supply side aspect of small towns water operations was investigated through the 'lens' of the different management models. In this chapter, the demand side is considered from the point of view of the customers, reporting on the investigations into the level of services consumers perceive they are receiving through the formal operators and also through alternative providers and self-access to alternative sources.

In planning improved water supply services to small towns in Ghana, evidence of 'demand', to justify new investments, has relied on what is provided for in the Small Towns Sector Policy. This is not the type of 'demand' that any commercial competitive supplier would recognise. The policy describes evidence of demand based on the following:

- "30% Demand:
  - 15% - Past community initiated projects
  - 10% - Community based organisations
  - 5% - Letters of request for water supply systems

Support for financing in this top-down 'Demand Responsive Approach' also requires significant justification through the perceived 'need':

- 70% Need:
  - 40% - Prevalence of waterborne diseases
  - 30% - Inadequate water and sanitation facilities" (CWSA, 2004a).

Estimation of the 'demand and need' is always done on ad hoc basis and it is expected that water supply systems provided will be managed sustainably – 'because of following the demand responsive approach' – though based on little evidence of any real link between a top-down DRA and sustainability. Sustainability based on demand has long been an objective of the National Community Water and Sanitation Programme as discussed in Chapter One. However, the way and manner that households in small towns express their demand for water supply services varies by town due to factors which are in variance to those on which the Small Towns Sector Policy depends.

It could be argued that in order to ensure sustainable community water projects in small towns in Ghana, evidence of demand should include other factors, particularly the views and expectations of potential consumers, which can only be determined through household surveys. This chapter presents results of such household surveys, undertaken in the eight small towns in Ghana, in order to achieve the second main research objective of investigating effective household demand for improved water and alternative source water. Though not an explicit objective of this research, this chapter indirectly evaluates the demand responsive approach which has been the basis for the implementation of small towns water supply under the NCWSP in Ghana.

The data presented will enable the assessment of the nature of the perceived need for water supply services, investigates the possible substitutes in the form of the alternative sources of water available and also the ability and willingness of the customers to pay for the services. It looks also at the customer satisfaction of the water supply services being delivered currently, as this directly measures consumer perceptions of the services of the operators.

Households' demand for water supply services in these small towns should also be viewed within the historical background, that small towns and rural communities never paid anything for water supply services provided by the central government. Ghana obtained its independence from Britain in 1957 and it was not until 1986, when the Government embarked on Structural Adjustment and Economic Recovery Programmes, that 'rural communities', including small towns, were required to start paying for water supply services. Up until that point the Public Utility Provider was receiving up to 50% subsidies on their operations (World Bank, 1994).

Throughout this chapter and subsequent ones, the acronyms C, Pv, Pu, DA will be used to represent respectively Community, Private, Public utility and District Assembly managed water systems (models). As the first main objective of this research is to investigate the performance of the management models in use in water supply delivery, the analysis carried out in this chapter is to enable comparisons to be made between what operators' data show is being delivered and what household's information show they are receiving. Therefore the analysis is largely based on the individual towns where the various management models are delivering the water supply services. The analysis is also made in terms of the different user groups especially standpipe and house connection users using the overall data set of all eight small towns combined, reflecting on aspects of equity in supply.

Overall the 285 samples in all the eight small towns has provided data on 152 users of water from the four management models and 133 users of the alternative sources as their main sources of water. Of the 152 users of the improved water systems, 57 are house connection users, 83 standpipe users and the rest use their neighbours' house pipes. The breakdowns of the randomly sampled respondents have confirmed the operators' data which shows that majority of the towns' populations who depend on improved systems are dependent on standpipes.

Analysis carried out based on the three zones and shown in Table 7.1 shows that there is no significant difference among zones regarding their mean per capita water consumption going by the decision criteria discussed in Chapter three as the calculated $F(2, 282)$ at $\alpha = 0.05$was 0.958 while $F_{critical}$ is 3.031. Similarly, the average per capita income for the zones have not shown any significant differences as $F(2,282)$ was calculated as 2.575 at $\alpha = 0.05$ while $F_{critical}$ is 3.031.

Table 7.1 Per capita water consumption and per capita incomes according to zones

Zones	*Lowest 25%*		*Upper 25%*	
	Consumption (litres/person/day)	*Income (Gh□/person/yr)*	*Consumption (litres/person/day)*	*Income (Gh□/person/yr)*
Northern	11.20	39.60	37.50	1027.00
Middle	10.80	65.30	39.70	1106.60
Southern	13.70	100.00	42.40	1546.20

Note: US$1 = Gh□1.068

On household sizes, the Northern Zone recorded the largest, 9.2 followed by the Middle Zone, 7.7 and the Southern Zone recorded the least, 5.3, another indication of the differences that exist in terms of the location of the water system in Ghana.

The chapter is structured into the following sections;

- Section 7.2 presents household sources of water in all eight towns
- Section 7.3 describes the nature of household demand for water supply services
- Section 7.4 describes the affordability of water supply services to households
- Section 7.5 presents customer satisfaction of water supply services provided.

Throughout this chapter where error bars are found in the charts they represent the standard error of the means discussed in Chapter Three and in tables the standard errors are presented in parenthesis adjacent the values recorded. The standard errors presented in the chapter are significant in the analysis of the results as they give an indication of the level of accuracy of the research figures relative to any extreme sample means. However the analysis of variance (ANOVA) was used to make decisions about the significant differences in the means of the eight towns in line with the decision criteria established in Chapter Three.

7.2 Households sources of water

The sources of water available to households, distances to the sources from households' places of dwelling and the time taken by a household member to make a round trip in fetching water all contribute to household demand for water and these factors are described below.

7.2.1 Proportion of households accessing the different sources of water

In all the small towns investigated there exist multiple sources of water available to households which are accessed variously by households as primary and secondary sources depending upon ultimate use. In each of the eight towns, households also depend on these different sources of water differently in both rainy and dry seasons. The sources available include house pipe, public standpipe, neighbour's house pipe, vendors, well, borehole, river/stream, pond and rainfall during the rainy season as shown in Figure 7.1 and Figure 7.2 below. House pipe, public standpipe and neighbour's house pipe represent dependency on the water supply systems provided by the government agencies whilst the remainder of the sources reflect the alternative, natural and freely accessible sources of water available.

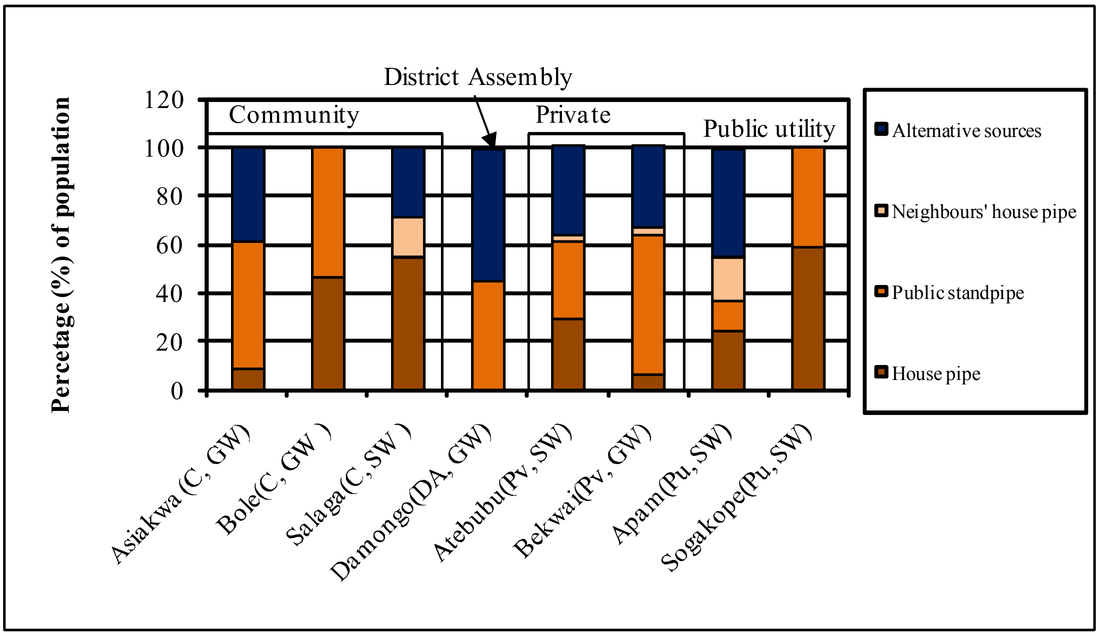

Figure 7.1 Proportion of households using the different sources of water as their primary sources in the rainy season

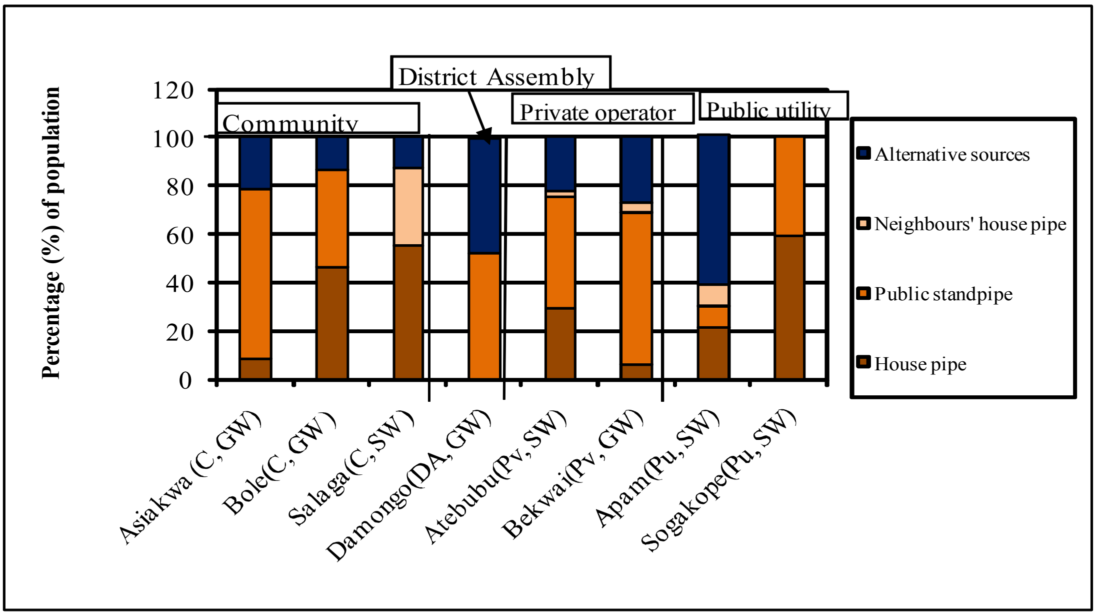

Figure 7.2 Proportion of household using the different sources of water as their primary sources in the dry season

In determining the coverage of water supply services provided by the formal service providers, the reliance of customers on their neighbours' house pipes are not usually captured but Figure 7.1 and Figure 7.2 show how significant numbers of customers rely on them for their supply especially in Apam and Salaga. Except in Apam, Bole and Sogakope, more households resort to the use of the water supply systems provided for by government agencies in dry season than the rainy season as their main sources of water. This is not unusual as many of the alternative sources of water dry up during the dry season. In Apam 54% of the households depend on the water supply provider as their primary source of water in the rainy season and 40% in the dry season. In Bole 100% of respondents say they depend on the provider as their primary source in the rainy season but only 87% in the dry season. This counter-intuitive response can be explained by supply constraints which were not captured from the estimates made from the operators' data. In towns such as Apam and Bole the operator is unable to meet the increased demand for water in the dry season and therefore consumers resort to the alternative sources in order to avoid the long queues. Sogakope recorded 100% dependency on the water supply provided by government as their primary source of water in both rainy and dry seasons confirming the coverage estimates in Figure 6.3. Figure 7.1 and Figure 7.2 above shows households' dependence on the different sources of water in each small town.

Figure 7.3 One of the eight mechanised boreholes in Damongo

Source: Braimah, C. A. (2007)

In Damongo, the water supply system relies on limited mechanisation of eight boreholes as shown in the picture in Figure 7.3 above, built by the European Union (EU), as an emergency intervention discussed in Chapter Four.

The households in Damongo do not have the choice of house connections and use only standpipes and the other alternative sources. Salaga has no users of the public stand pipes because they are not in operation due to low pressure in the water system. In Asiakwa no household depends on a neighbour's pipe as their primary source of water.

The multiple alternative sources of water in these small towns have implications on households' demand for water supply from the formal service providers with the likelihood of affecting the financial sustainability of the small towns' water supply projects.

7.2.2 Average distances between households' places of dwelling and their sources of water

In addition to available sources of water, the distances households need to travel in order to access water affects the households demand for water supply services. Especially as in these small towns, customers' measure of water quality is by smell, taste and colour (Fieldwork, 2008). In this section the sources of water have been categorised further into piped water system (house pipes, standpipes and neighbour's pipe) and alternative sources (vendors, well, river/stream, private borehole, pond and other).

The WHO/UNICEF Global Water Supply and Sanitation Assessment 2000 Report categorises a water source situated at one kilometre or less from customers as being within a 'reasonable access' (WHO and UNICEF, 2000) while CWSA considers as reasonable access a distance of not more than half a kilometre (World Bank, 1994). Figure 7.4 below shows the average distances from the households' places of dwelling to their sources of water.

In all towns, as shown in

Table 7.3, the maximum distances from the households' places of dwelling to the formal water supply sources are greater than the minimum distances from the households' places of dwelling to the alternative sources. This raises some critical concerns about households' demand for water supply from the formal systems as there are households who live closer to the alternative sources than the formal sources. During fieldwork, it was observed in Atebubu, Bole, Damongo and Salaga that bicycles were being used to carry water. The household surveys show that in these four towns households have either a bicycle or a motor bike as shown in Table 7.2 below, and in some cases both and these are being used to draw water for household consumption.

Table 7.2 Households with bicycles and motorbikes

Small town	Households with bicycles (%)	Households with motorbikes (%)
Asiakwa	13	0
Bole	73	47
Salaga	97	52
Damongo	63	26
Atebubu	80	29
Bekwai	15	8
Apam	33	4
Sogakope	68	5

With these means of transport available to households the challenge of longer times and distances in accessing water from any source might not be such an issue with respect to choice of that source, particularly where there is no fee to access the source.

In all small towns investigated the average distances from the households' places of dwelling to the alternative sources of water are longer than to the formal water supply points. The average distances from households' places of dwelling to the alternative sources for the 285 population sampled in all eight small towns is 820 meters. Overall, Bole (C), Salaga (C), Atebubu (Pv) and Apam (Pu) have recorded relatively the lowest and about equal distances from the household's places of dwelling to the alternative sources. These four towns recorded distances to the alternative sources shorter than the estimated average for all the towns while the other towns, Asiakwa (C), Damongo (DA), Bekwai (Pv) and Sogakope (Pu) recorded distances greater than the average distance for all 285 households. The distances households in Damongo travel to access the main water sources are about the same as what households in Bole, Salaga, Atebubu and Apam travel to access the alternative sources. Table 7.4 and Table 7.5 below show that significant differences exist between the average distances from households' places of dwelling to both their alternative water sources and the water supply points at 5% level of significance.

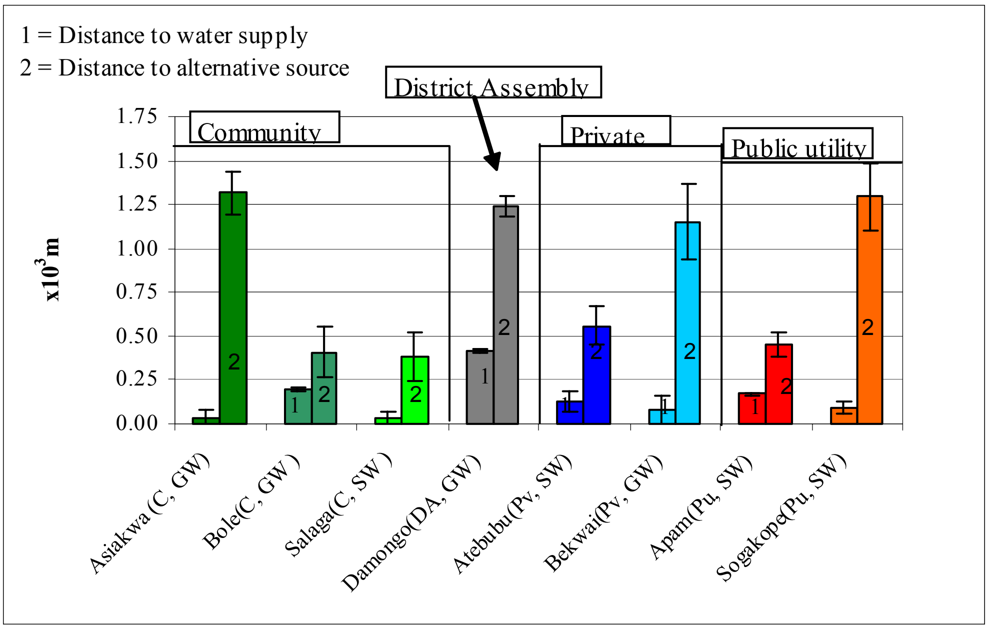

Figure 7.4 The distances in metres from households' places of dwelling to their water sources

Note: Average distance to alternative sources for all towns =0.82 (n=285)

Table 7.3 Average, maximum and minimum distances (x1000 metres) from households' places of dwelling to their water sources

Water supply system	**Apam**	**Asiakwa**	**Atebubu**	**Bekwai**	**Bole**	**Damongo**	**Salaga**	**Sogakope**
Minimum	0	0	0	0	0	0.02	0	0
Average	0.17	0.04	0.13	0.08	0.2	0.41	0.03	0.09
Maximum	1.4	0.2	1.6	0.5	0.65	2.4	0.15	0.5
Alternative sources								
Minimum	0.0	0.1	0.01	0.0	0.02	0.02	0	0
Average	0.97	1.32	1.01	0.41	0.56	1.25	0.38	1.29
Maximum	3.0	2.5	3.0	2.0	1.5	4.8	2.0	2.5

Table 7.4 ANOVA results for distances of households' places of dwelling to their alternative sources of water

Source of Variation	*SS*	*df*	*MS*	*F*	*P-value*	*F crit*
Between towns	33.13972	7	4.734245	8.96035	7.55E-10	2.04647
Within towns	131.5604	277	0.528355			

Total	164.7001	284				

Table 7.5 ANOVA results for distances from households' places of dwelling to the water supply points

Source of Variation	*SS*	*df*	*MS*	*F*	*P-value*	*F crit*
Between towns	2.994592	7	0.427799	6.813345	2.07E-07	2.04647
Within towns	15.6343	277	0.062788			
Total	18.6289	284				

In addition to the distances to households' sources of water from their homes, the time spent in collecting water is another factor that can influence greatly households' demand for water and also their choice of source. (Mu et al., 1990), have found in their research that households' choice of water source is a function of the time it takes to collect water from the source. WHO/UNICEF (2005) have indicated that the longer it takes a household member to make a round trip in fetching water the less water is collected. It is therefore necessary to investigate the extent to which, with a water source close to a households' place of dwelling but which records queues every time, the household members will prefer to draw water from a farther source where there are no queues and will get water home in a relatively shorter time overall. This is the situation in some of the small towns and Figure 7.5 below shows the average times households claim they spent in search of water. A zero time indicates a water source within the household's house.

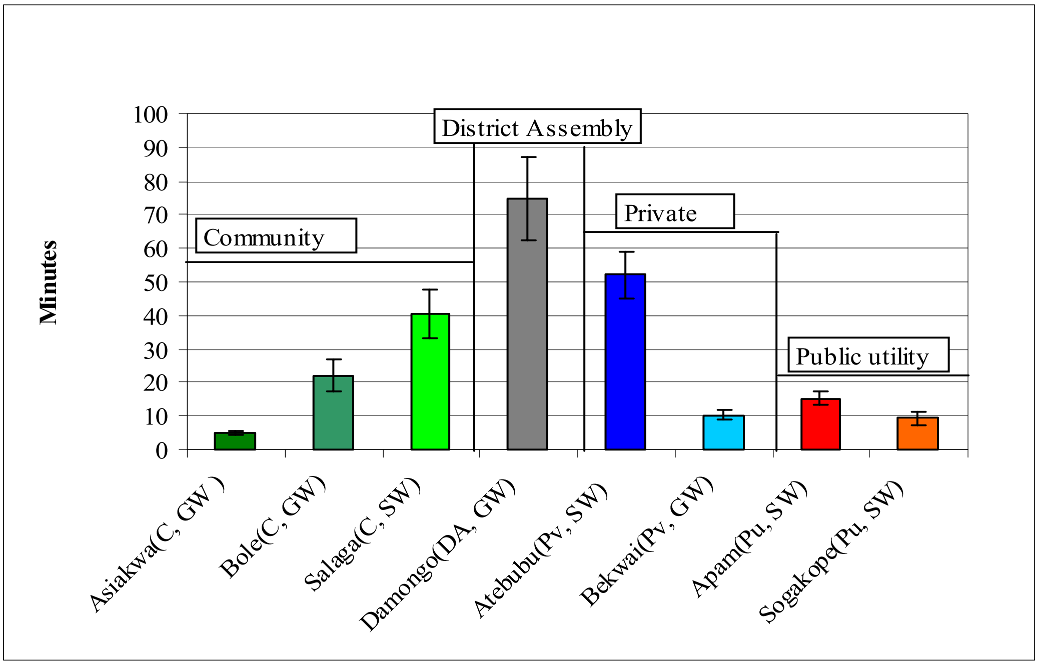

Figure 7.5 Average round-trip time for water collection
Average round-trip time for all towns = 28 minutes (n=285)

The WHO/UNICEF Water for life report indicates that a household with 'basic access' to water supply should spend no more than 30 minutes in any round-trip to collect water (WHO and UNICEF, 2005). In this research the average time households' in the eight towns spent in getting water home is 28 minutes higher than the times recorded for Asiakwa (C), Bole (C), Bekwai (Pv), Apam (Pu) and Sogakope (Pu). Figure 7.5 and Table 7.7 below show that three towns out of the eight, Atebubu, Damongo and Salaga, have recorded average round trip times above this average and the analysis of variance results in Table 7.6 below shows that indeed there are significant differences between the average round trip times in the towns at 5% level of significance.

Table 7.6 ANOVA results for households' round trip time in search of water

Source of Variation	*SS*	*df*	*MS*	*F*	*P-value*	*F crit*
Between towns	132524.1	7	18932.02	18.81879	4.32E-20	2.04647
Within towns	250498.2	277	1006.017			
Total	383022.3	284				

Table 7.7 Average, minimum and maximum round-trip time for water collection

	Apam	**Asiakwa**	**Atebubu**	**Bekwai**	**Bole**	**Damongo**	**Salaga**	**Sogakope**
Minimum (mins)	0	0	0	0	1	15	0	0
Average (mins)	15.39	5.0	52.0	10.35	22.13	74.7	40.48	9.43
Maximum (mins)	60	30	180	35	45	240	180	30

Overall the numbers show that, and it is the reality in the towns, in Asiakwa, Bekwai and Sogakope queues are not recorded at the water points but the same cannot be said about the other towns. It is indicative therefore that except for Asiakwa, Bekwai and Sogakope, the round-trip time for water collection is an incentive for households in the towns to turn to other alternative sources for water but at varying degrees.

In relation to the overall data consumers depending on the operators (management models) show different round trip times for standpipe users and house connection users. Overall households using the improved water systems (n = 152) recorded average round-trip time of 25.7 (3.1) in minutes of which standpipe users (n = 83) recorded 31.5 (4.7) minutes and house connection users (n = 57) recorded 14.5 (3.7) minutes (figures in parenthesis represent standard error). As expected users of house connections spent less time in getting water to the households than those using stand pipes. It should be recalled that in these small towns there are a number of households in a house compound which are served by a single yard pipe, referred to here as house pipe, but which still may require queuing when other households are also trying to access the single yard tap at peak times.

7.3 The nature of household demand for water

This section presents results on household per capita consumption at towns' level and sources of water and investigates these relative to the household size.

7.3.1 Water consumption

The actual water consumption in a household is the most important element in assessing effective (future and paid) household water demand as all households require some amount of water on daily basis for their domestic use. But the manner in which a household apportions which water source to be used for which household's need differs from one household to another, also related to the perceived quality of the sources. It would therefore be instructive, beyond knowing the household consumption, to understand something more about customer behavioural traits regarding which source of water they use for each of the household needs but this is not within the scope of this research.

The small towns policy (operation and maintenance guidelines) suggests that, for water users relying on standpipes, a per capita water consumption of 20 litres per day, and for users of house pipes, 60 litres per day is considered the basic water supply service (CWSA, 2004b). There is no justification in the guidelines as to why households with connections have a 'basic needs' requirement for water which is three times higher than those without as data available does not show any significant differences (see Table 7.9) in consumption. Whilst house connection users (n = 57) recorded per capita consumption of 26.4 (1.7) litres/day, those using standpipes (n = 83) a consumption of

23.2 (1.2) litres/person/day was recorded. Also whilst households using the improved water systems (management models) (n = 152) recorded an overall average of 24.4 (0.9) litres/person/day, households using the alternative sources (n = 133) recorded on the average 24.9 (1.2) litres/person/day. Based on management models, community (n = 81), recorded consumption of 25.1 (1.5), Private (n = 105) recorded 23.9 (1.3), Public utility (n = 68) recorded 25.9 (1.4) and the District Assembly (n = 31) recorded 22.08 (1.5) litres/person/day on the average. All figures in parenthesis represent the standard error of the means. The per capita water consumption from the analysis is about the same for all the different user groups. The lowest users at the 25% level of the private operator, public utility, community and District Assembly managed towns recorded consumptions of 10.8, 12.6, 12.2 and 13.1 litres/person/day respectively, whilst the users in the highest 25% band recorded 39.7, 42.2, 40.4 and 33.4 litres/person/day in the same order.

In each of the eight small towns investigated, the average per capita water consumption, shown in Figure 7.6 below, of households in all eight towns are above 20litres/person/day, considered as the minimum consumption when using a standpipe but these totals also include alternatively sourced water. Such consumptions are however below the consumption (60litres/person/day) considered as basic service in terms of a house pipe. At these present levels of consumption, between 9% and 65% of the households surveyed say their consumption is not enough, an indication of the existence of additional demand over what is being received - and which could be filled by the formal operator managed supply, though of course this says nothing about household's preparedness to pay for additional amounts. For example, about 20% of the households surveyed in Apam (public utility), about 9% in Asiakwa (community), 61% in Atebubu (Private), more than 21% in Bekwai (Private), more than 33% in Bole (Community), about 60% in Damongo (District Assembly), about 65% in Salaga (Community) and more than 19% in Sogakope (Public utility) say their present water consumption levels are inadequate. This suggests that in all eight small towns the formal water supply operators are not meeting the idealised demand of the households.

It is unclear as to whether the alternative sources could meet this additional demand, but that households are not prepared to invest sufficient resources in accessing it, and similarly whether the formal operators could deliver more water if households were prepared to pay more. But from the analysis of the consumption patterns of the different user groups in all towns it is clear that in general consumption is similar and low relative to the CWSA estimate for house connection users.

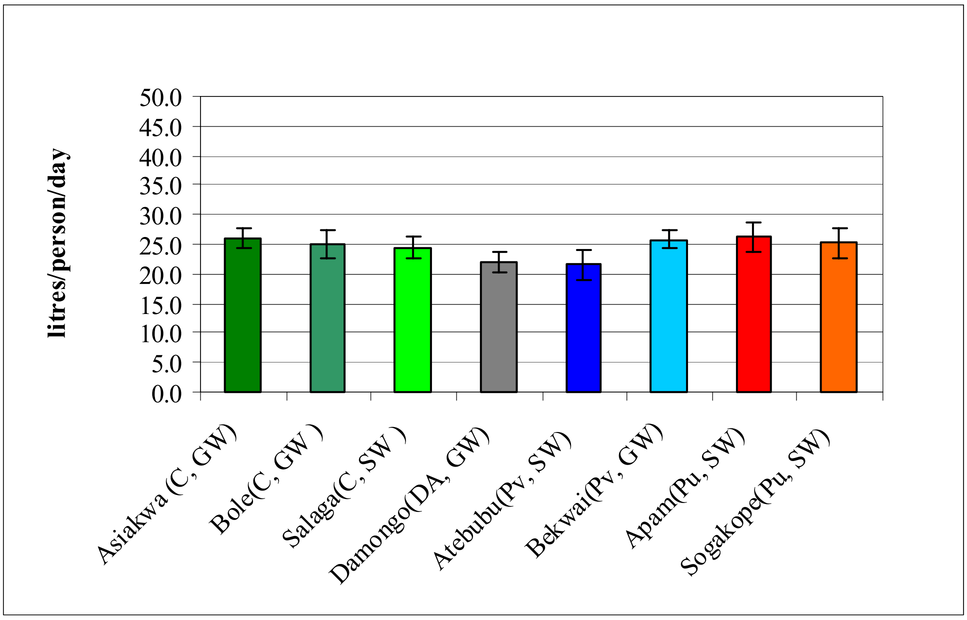

Figure 7.6 Per capita water consumption of households in eight small towns in Ghana

Note: Average per capita water consumption for all eight towns (n = 285) is 24.6 litres/person/day

Figure 7.6 above shows that it is only in Salaga (C), Damongo (DA) and Atebubu (Pv) where households' per capita water consumptions are lower than the overall average of the towns and Table 7.9 shows that for all the eight towns, there are no significant differences in the average per capita water consumptions recorded.

Table 7.8 Average, minimum and maximum per capita water consumption of households in litres/person/day

	Apam	Asiakwa	Atebubu	Bekwai	Bole	Damongo	Salaga	Sogakope
Minimum	8.3	13.5	3.9	7.1	7.0	9.4	4.3	6.0
Average	26.2	26.1	21.6	25.8	25.1	22.1	24.4	25.2
Maximum	50.0	56.3	60.0	60.2	45.0	37.5	75.0	54.0

Table 7.9 ANOVA results for households' daily per capita water consumption

Source of Variation	*SS*	*df*	*MS*	*F*	*P-value*	*F crit*
Between towns	813.4972	7	116.2139	0.843664	0.55206	2.04647
Within towns	34299.5	277	137.749			
Total	35113	284				

7.3.2 Household size

Household size is an important determinant of demand for water as is shown in Table 7.10 below, that large households consume more water than smaller households but with a lower per capita consumption. Also a smaller-sized household can more easily get water from a neighbour than a larger household and, because the inconveniences of lack of water affects more people in the case of large households, larger households clearly demand more water than smaller ones (Kayaga et al., 2003). During the fieldwork, children and women were mostly seen in these towns carrying water, an indication that household size and the household characteristics together influence demand for water at the household level. This is because, households with more women and children will have more people going out for water. The combination of large household sizes (including the role of compound houses) and households' possession of bicycles, described in section 7.2 above, poses an interesting challenge to the system operators in small towns to consider to what extent customers' demand for water could or should be delivered from their systems, and at what price.

One major challenge which small towns water implementation agencies have to contend with in the design of any future projects is the rapid population growth. Figure 7.7 illustrates that average household sizes in the eight small towns have increased between the year 2000 and the year 2008. The increase varies between 20.5% in Asiakwa and about 106% in Bole. This is at a time when the overall population of the towns has increased by 51.7%. Table 7.10 is showing that the is a relationship between household size and household water consumption (litres) and Figure 7.7 shows the rate of growth of household sizes in the small towns. The analysis of the relationship between household size and per capita daily consumption produced a correlation coefficient of -

0.00681, an indication of no relationship between the two variables as the coefficient is not significant.

Table 7.10 Household size and household consumption by management models

Management model	Average household size	Average household consumption (litres)
Community managed	8.2	187
Private operator managed	7.7	167
Public utility managed	5.5	134
District Assembly managed	7.9	175
All towns average	6.3	135

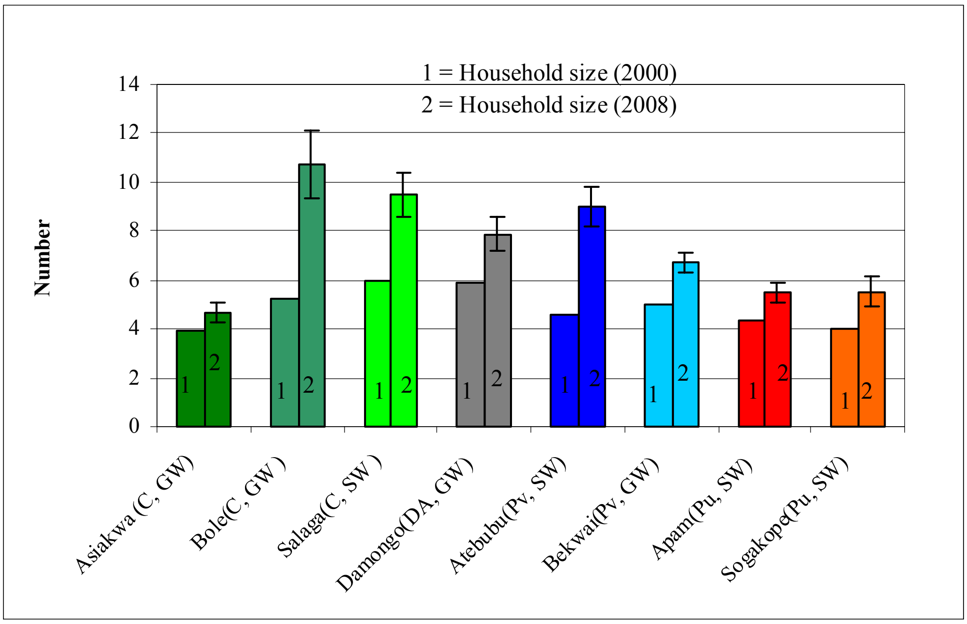

Figure 7.7 Average household sizes in eight towns in Ghana in 2000 and 2008 and a table of the minimum and maximum household sizes recorded for the towns in 2008

Source: Analysis of household survey data and (GSS, 2005)

Table 7.11 Average, minimum and maximum household sizes

2008 data	Apam	Asiakwa	Atebubu	Bekwai	Bole	Damongo	Salaga	Sogakope
Minimum	1	1	3	1	5	4	3	1
Average	5.5	4.7	9.0	6.7	10.7	7.9	9.5	5.5
Maximum	16	9	29	14	23	17	26	11

In small towns in Ghana, the economic activities of households are relatively limited and tend not to be particularly labour intensive, hence the opportunity cost of directing any excess labour in search of water elsewhere for household use favours that use by the household. The implication of this is that when customers view the services of the operators negatively, they will surely turn to the free alternative sources. This is one of the challenges all operators in small towns water supply schemes have to deal with. The customer satisfaction of the operations of the formal water providers is discussed in section 7.5.

Rapid population growth in small towns has been cited as one of the major challenges confronting small towns water delivery (BNWP, 2002). In rural Ghana, including small towns, people still live 'traditional lives' and are very much attached to their cultural and religious practices. Polygamy and the extended family concepts are observable features of the households in these towns, contributing largely to the increased household sizes between 2000 and 2008. It is therefore important that, in order to achieve the desired impact of water supply services, the culture of the people to which the services are intended must be given greater consideration (Webster, 2006).

In Atebubu, Salaga and Bole it was observed that, in some households, the Qur'an is being taught and the pupils who come from outside the towns stay with the households for several years until they complete their training, a process which can take up to five years. Such developments have significantly increased the sizes of some households, an indication that in order to assess household demand for water households' characteristics and sizes must be assessed in more detail for each town at the planning stage. It is also important to understand that the number of women in a household in a small town significantly affects the choice of source to use for household water needs (Mu et al., 1990) and this was collaborated in the small towns investigated through observations.

The different factors that have been outlined above and considered as contributing differently to the household sizes in the eight towns have been justified by the ANOVA results in Table 7.12 as it shows that there are significant differences in the household sizes recorded at 5% level of significance.

Table 7.12 ANOVA results for household sizes

Source of Variation	*SS*	*df*	*MS*	*F*	*P-value*	*F crit*
Between towns	833.55518	7	119.07931	8.1125585	6.82E-09	2.0464699
Within towns	3654.9195	277	14.678392			
Total	4488.4747	284				

7.4 Affordability of water supply to households

The proportion of a households' income spent on any commodity, including water, affects demand for that commodity either positively or negatively if all other factors remain the same. As described already, in small towns in Ghana where there are alternative sources of water, some which are free, if water tariffs are not affordable to the households they will turn to the alternative sources for their supply, thereby denying the operator revenue. In determining affordability of water supply to households, a sub-objective of this research, generally between 3% to 5% of the households' income or expenditure is used as a measure of the affordability of the service (Nyarko et al., 2006; Fankhauser and Tepic, 2007). In a commoditised market it is true that, where there are alternatives, the individual or household's demand is greatly influenced in addition by preferences and not only the price level. In order to understand households' relative preferences for water, in the face of the existence of alternative sources of water as well as other basic needs, the expenditure of households on water relative to household expenditure on electricity and mobile phones was also investigated. The inclusion of mobile telephones makes an interesting, and hopefully illuminating, contrast to the basic needs presumption of demand for water and electricity.

7.4.1 Household Income and expenditure on water

In Ghana to date, the historical 'dinosaur' of non-payment for water supply services still hangs over the country, necessarily re-emphasising the point that consumers in small towns did not pay for water until 1986 (World Bank, 1994). There are some civil society organisations who are still (very strongly) of the opinion that "water is life' and therefore that it is the duty of Government to provide all citizens water at 'least'/zero price, irrespective of the cost of supply (Interview with Dr Steve Manteaw, ISODEC, 2007). In the eight small towns investigated, households who depend on house pipes, standpipes, vendors and some boreholes pay for water use but those that depend on wells, streams, ponds and some boreholes do not pay directly for water.

Table 7.13 shows that consumers resorting to the alternative sources of water as their main water sources cannot cite poverty as the reason for not using the improved water sources. Relatively they have similar per capita incomes as those using the water supply systems. However consumers using public standpipes are poorer than those with house connections but the standpipe users pay more for water than those with house connections. It is therefore important that any tariff adjustments are done with these different user groups and their relative incomes in mind when tariffs are to be equitable.

Table 7.13 Analysis of households' annual per capita and households' expenditure on water in Ghana cedis for the different user groups

Note: In 2008 on the average US$ = Ghc 1.068	**Per capita income**	**Expenditure on water**
All small towns (n = 285)	452.5 (25)	133.2 (9.6)
All water supply users (n = 152)	449.5 (55)	165.6 (13.2)
House connection users (n = 57)	669.2 (93.6)	154.8 (20.4)
Standpipe users (n = 83)	374.38 (49.7)	169.2 (18.0)
Alternative sources users (n=133)	461.4 (50.9)	10.5 (1.8)
Community managed (n = 81)	448.7 (82.7)	91.2 (13.2)
Private operator (n = 105)	451.3 (62.4)	109.2 (13.2)
Public utility (n = 68)	586.4 (76.3)	171 (22.8)
District Assembly (n = 31)	367.3 (85.2)	231.6 (4.8)

Note: Data in parenthesis represent standard errors

The distribution of incomes within the population in the various management model towns varies significantly. For example the lowest 25% incomes have been recorded as Gh□22.50, Gh□52.70, Gh□65.30 and Gh□135.80 for District Assembly, Community, Private operator and Public utility managed models. These differences in income levels could possibly be one of the reasons why the GWCL at the inception of the NCWSP held onto some small towns that should have been transferred to the district Assemblies to be community managed.

Figure 7.8 below shows the percentage of household income spent on water and the declared willingness of the households to pay more for water if the present service was improved. From this survey data, it appears that it is only in Asiakwa and Damongo that, on average, households spent more than 5% of their household income on water. Overall in all the towns, households spent an average of 4.2% of the household income on water, ranging between 2% in Bole and more than 8% in Damongo. The levels of households' expenditure relative to their incomes are pointing to the fact that increases in tariffs in small towns are possible without making them unaffordable especially for house connection consumers who are relatively wealthier, consuming more water per person but paying relatively lower tariffs. Increased tariffs is very much possible in towns such as Sogakope where in both rainy and dry season 100% of households depend on the improved water systems as their main source. However, any proposal for tariff increases must be handled carefully as willingness to pay more if present services were improved is not reflecting any affordability analysis. For example in Bekwai, where water costs households about 3% of their incomes on average, approximately 52% declared they were not willing to pay more than the present level. And in Sogakope, where on the average households spend 2.5% of their incomes on water, 45.5% are not willing to pay any higher tariff above the present level. On the other hand in Damongo, where households have limited sources of water and travel relatively longer distances for water as shown in both Figure 7.4, close to 90% of all households surveyed are willing to pay more if the present service level were improved, although they are spending more than 8% of their incomes on water already. In Salaga where households spent 2.7% of their incomes on water, more than 90% are willing to pay more if the services were improved. It is more likely that the willingness to pay more has been influenced by the households' perceived level of service being received presently and not about the proportion of household income spent on water.

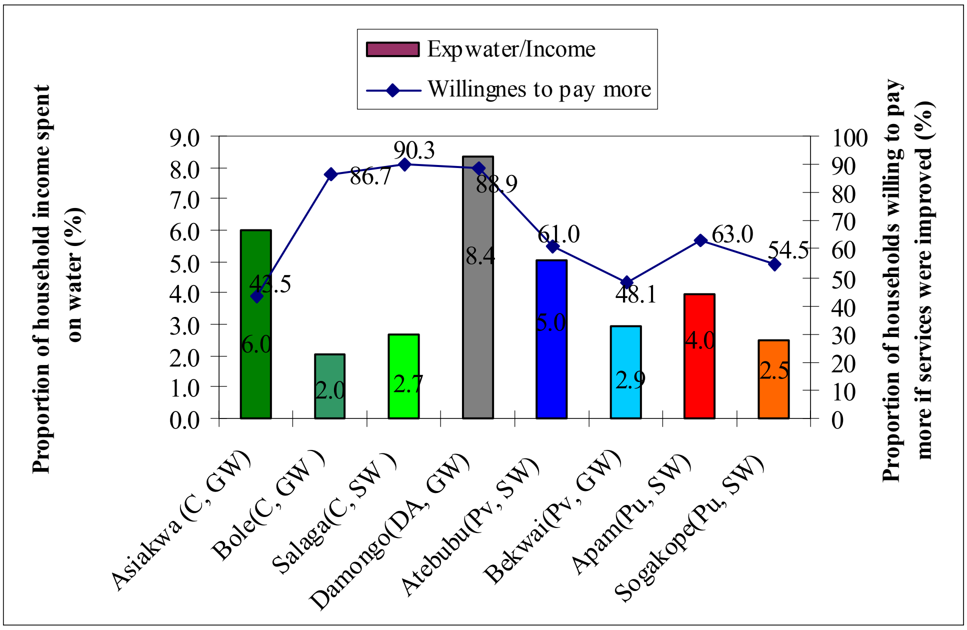

Figure 7.8 Shows the affordability of water supply and households' willingness to pay more for improved services above what is being received

On average the District Assembly managed town is showing the highest willingness to pay more (89%) followed by the Community managed towns (61%) with the least willingness in the private operator managed towns (48%). Willingness to pay more in all the small towns is another indication of the possibility of increasing water tariffs in these small towns, above what is presently being charged. However inspecting the results there was no pattern that suggests that willingness to pay in all the towns was related to the household per capita income.

7.4.2 Household expenditure on water versus the expenditure on electricity and mobile phone usage

Complementary reporting Braimah and Franceys (2009) has suggested that, as much of the capital expenditure for small towns water supply systems is received from external donors, the temptation to over-design water projects, ahead of the ability or willingness of customers to pay, might be building up sustainability problems for providers. Generally the inability of small towns water systems to generate enough revenue for their recurrent and capital maintenance has been blamed on the poor economy of those towns but Figure 7.8 shows that some system operators do not even charge tariffs that take account of household’s income where, in some circumstances, those incomes indicate that more cost reflective tariffs would be a possibility.

Water is generally considered as a basic necessity of life and it is often said that ‘Water is Life’. In Ghana, the poorest groups of the population are said to be living in rural communities and small towns (World Bank, 1994; NDPC, 2005) and generally, the provision of water supply services to the population is considered as a sure way of ensuring economic growth and poverty reduction in Ghana (NDPC, 2005). With the aforementioned, water is supposed to be an indispensable commodity within the households of small towns. In Figure 7.9, households’ expenditure on water supply and the expenditures on electricity and mobile phones are compared as the backdrop in revealing the realised necessity of water to the household. This is to further establish the ability of consumers to pay for increased tariffs over what is being paid for water as ability to pay is a criteria for assessing the possibility of operators achieving financial sustainability.

In Figure 7.9 below, only Asiakwa and Damongo, where customers of the water systems are paying 5% and more than 8% of their incomes for water, are paying more for water than for electricity. The trend in Asiakwa is attributable to two main reasons. First, due to the relatively small number of households in compound housing in Asiakwa, the electricity consumption measured by the single meter per house is always low. In Ghana domestic consumption per meter not more than 150kWh is seen as lifeline consumption and is subsidised by the government. In Asiakwa there are 1.7 households in a house compared to Apam 2.4, Atebubu 4.3, Bekwai 4.2, Bole 4.0, Damongo 2.3, Salaga 2.9 and Sogakope 3.7. Secondly, the household survey shows that close to 22% of all households surveyed do not use electricity and this has been collaborated by the observation made of people recharging their lamps during the day in friends' houses, an indication of their use in the nights. In the rest of the small towns, households pay between 53% of the expenditure on electricity for water in Bekwai and 90% of the expenditure on electricity for water in Sogakope. Considering households' expenditure on water relative to mobile phone usage, Figure 7.9 shows that in all eight small towns households spent more of their income on mobile phones than water. In Bole, households spent just 20.5% of their expenditure on mobile phones on water whereas in Damongo households spent almost 84% of their expenditure on mobile phone usage on water. Analysing the households' monthly expenditures on the three services by the different user groups and by aggregating the data by all small towns and management models as shown in Table 7.17, similar trends of household spending more of their household income on electricity and mobile phones than water are observed.

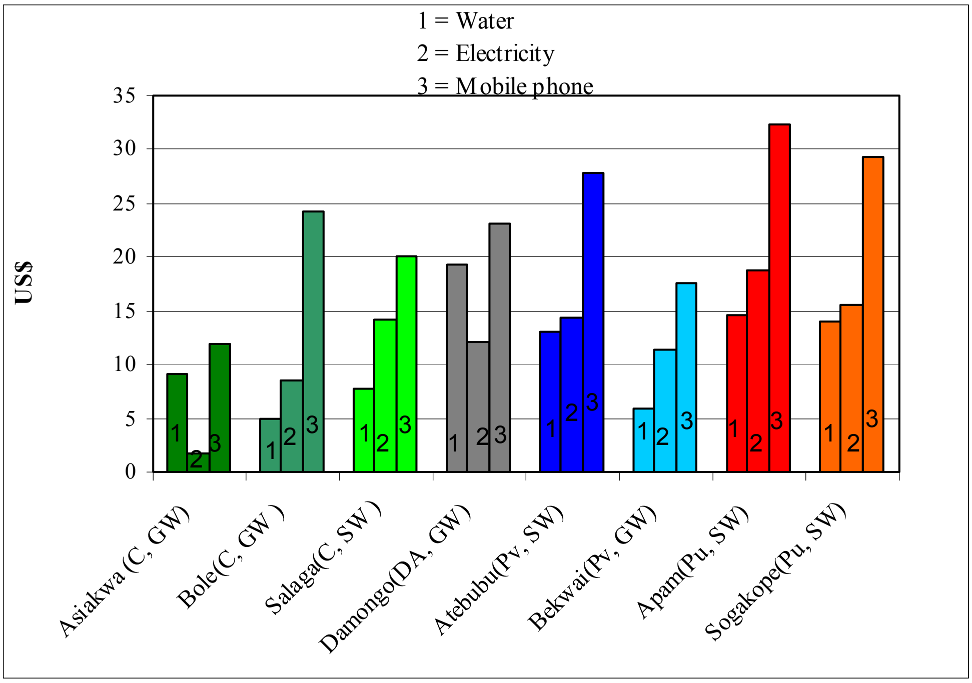

Figure 7.9 Households expenditure on water, electricity and mobile phone usage in a month

As much as the analysis has established similar trends of households' expenditures on water, electricity and mobile phones in almost all the towns, Tables 7.14, 7.15 and 7.16 show that there are significant differences in the average expenditures calculated at 5% level of significance between the towns.

Table 7.14 ANOVA results for households' monthly expenditure on water

Source of Variation	*SS*	*df*	*MS*	*F*	*P-value*	*F crit*
Between towns	5053.1265	7	721.87522	4.9900091	2.635E-05	2.0464699
Within towns	36021.363	277	144.66411			
Total	41074.49	284				

Table 7.15 ANOVA results for households' monthly expenditure on electricity

Source of Variation	*SS*	*df*	*MS*	*F*	*P-value*	*F crit*
Between towns	5152.5832	7	736.08331	3.7214162	0.0007522	2.0464699
Within towns	49251.343	277	197.79656			
Total	54403.926	284				

Table 7.16 ANOVA results for households' monthly expenditure on mobile phone usage

Source of Variation	*SS*	*df*	*MS*	*F*	*P-value*	*F crit*
Between towns	10481.426	7	1497.3466	2.2635173	0.0299482	2.0464699
Within towns	164716.79	277	661.51323			

Total	175198.22	284				

The willingness of households to spend more of their incomes on mobile phones in these small towns than water require further investigation in order to establish the underlying factors. It must be emphasised here that while water supply to these small towns, presumably in reality on a top-down perception of need basis as against the demand responsiveness being suggested by NCWSP, mobile network expansions are based on market forces. Again if the bases for estimating water coverage figures in small towns is applied to mobile phone usage it could be concluded that there is 100% coverage going by the previous analysis indicating 2.6 mobile phones per household in Ghana which has an average household size of 5.1.

Table 7.17 Analysis of households' expenditures in Ghc on water, electricity and mobile phones in a month

Note: In 2008 on the average US$ = Ghc 1.068	Expenditure on water	Expenditure on electricity	Expenditure on mobile telephony
All small towns (n = 285)	11.1 (0.8)	12.9 (0.9)	23.6 (1.6)
All water supply users (n = 152)	13.8 (1.1)	12.7 (1.1)	24.1 (2.3)
House connection users (n = 57)	12.9 (1.7)	16.5 (1.8)	30.0 (4.3)
Standpipe users (n = 83)	14.1 (1.5)	9.7 (1.5)	20.7 (2.8)
Alternative sources users (n=133)	0.88 (0.03)	13.3 (1.5)	22.9 (2.3)
Community managed (n = 81)	7.6 (1.1)	8.8 (1.2)	18.2 (2.5)
Private operator (n = 105)	9.1 (1.1)	12.7 (1.6)	22.1 (2.9)
Public utility (n = 68)	14.3 (1.9)	17.6 (2.0)	31.4 (3.3)
District Assembly (n = 31)	19.3 (3.0)	12.2 (2.5)	23.1 (5.24)

The expenditure of households on water relative to their expenditures on electricity and mobile phones shows the household scale of preference for water, electricity and mobile phones. The relative expenditures have also shown the effect that available substitutes (supplementary in some cases) for household water have on the expenditure households make on water relative to electricity, which has limited substitutes, and mobile phones which have no substitutes at all. For water supply as discussed in section 7.2.1 above, there are in all the small towns, free alternative sources of water available to the households, hence the lower figures of expenditure relative to electricity and mobile phone usage. For electricity, some households depend on firewood for cooking and kerosene lamps for lightening and, as established during the survey, some households use rechargeable lamps that are recharged from their neighbours' houses. But for the mobile phones there are no substitutes in these towns as all the 'communication centres' which used to serve the population with landlines have closed due to the widespread coverage offered by the mobile phone operations.

The analysis has shown that, beyond a certain level of basic needs access, as long as households have access to alternative sources of water their additional demand for water will continue to be spread across the multiple sources, taking advantage of the free access to alternative sources supported by the 'free' household labour and transport available. Households prefer to use their limited household budgets to pay for additional access to communications rather than additional water. Stakeholders must be guided by this understanding when planning small towns' water projects. Any assessment of demand for water supply in small towns should, in addition to assessing ability and willingness to pay, be matched by the households' willingness to give up the use of all unimproved available sources of water.

7.5 Customer satisfaction of water supply services provided

Generally, the water industry enjoys a natural monopoly as customers in any particular community, even in the 'developed' countries, cannot choose between service providers. However, in small towns in Ghana, as already discussed, the service providers are in competition with alternative sources of water which are largely free for use (in financial terms) by households. Thus for households to decide to use water supplied by the operators, of whatever model, their demand must be met at the right time in the right quantity and quality and price if they are to attract the loyalty of the consumers. Kayaga et al. (2003) indicates that research into various services has established a strong correlation between customer satisfaction and customer loyalty.

In any competitive business, customer satisfaction is the way customers differentiate between different suppliers. Customer satisfaction, which is one of the components of the customer perspective in the balanced scored card management approach, could also be used by managers when they wish to have a holistic view of the performance of their organisations (Kaplan and Norton, 1996). According to these authors, customer satisfaction is an important measure of how well services are being delivered to customers and that customer satisfaction allows organisations to examine themselves in terms of how they are viewed by customers in the attempt to achieve their objectives and meet customer expectations in order to ensure sustainability.

In assessing customer satisfaction of water supply services provided by the small towns operators in the eight towns, opinions as to how satisfied customers are on water quality, hours of flow of water per day, water pressure in taps, complaints handling, queues at water points and water tariff were solicited.

7.5.1 Customer satisfaction of water quality

In small towns water supply, the CWSA quality standard is based on the WHO and the Ghana Standard Board quality standards. But the customers' measure of water quality in these small towns is based on their perception about the colour, taste and smell and not on any scientific standards. The perception about the quality of the water is a driver for demand for water from the operators or a reason or perhaps a justification to resort to the alternative sources. For example, in Bekwai (Pv), where ground water is used as the source of water, customers think the water does not lather well when used to wash their clothes and this has a direct bearing on the households' expenditure on soaps and detergents. Some even remarked that the water is not "sweet" for drinking. In Asiakwa (C) where ground water is also the source of water, customers refused to drink water from the taps at the commencement of the water project until an "Aqualine" machine was installed to remove the ions that give the water the taste disliked by the consumers. This additional equipment ultimately increased the investment cost.

Figure 7.10 shows the percentage of all households surveyed who are either *very satisfied* or *satisfied* with the water quality.

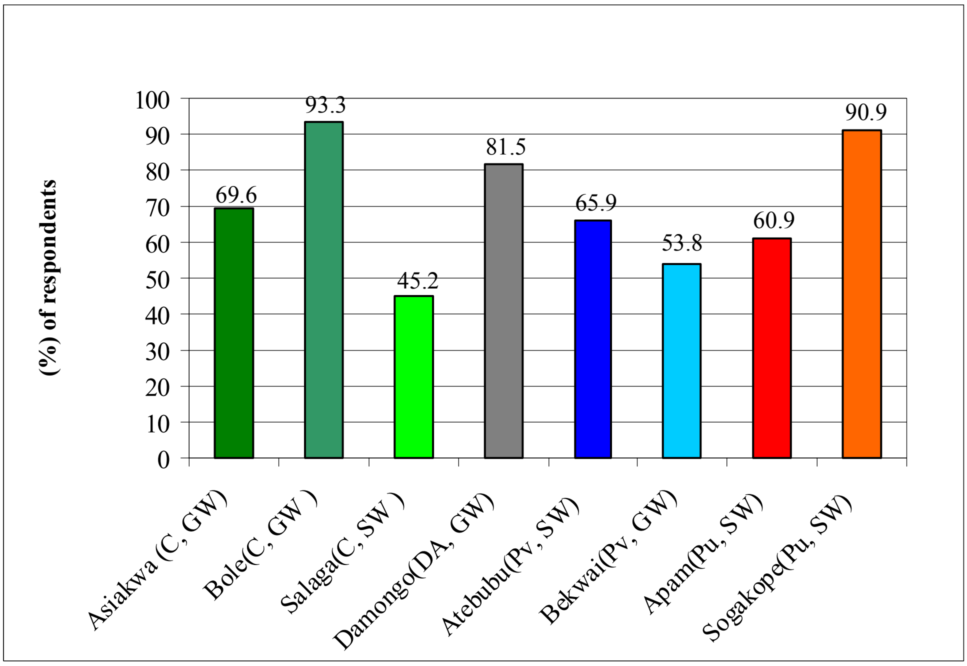

Figure 7.10 Percentage of households surveyed who are satisfied with the water quality of the operator

The graph above shows that Bole (C), Damongo (DA) and Sogakope (Pu) recorded very high customer satisfaction of water quality, above 80%. Among the three towns only Sogakope Pu) uses surface water as its raw water source with Salaga (C) which also uses surface water, recording the least customer satisfaction of about 45%. The remaining towns recorded between 53% and about 70% satisfaction of the water quality, with no obvious reasons for that variation.

Table 7.18 Satisfaction of water quality provided by water supply systems by the different user groups

User groups	%
All water supply users (n = 152)	69%
Community managed (n = 81)	63.8
Private operator managed (n = 105)	59.1
Public utility managed (n = 68)	70.6
District Assembly managed (n = 31)	81.5
House connection (n = 57)	71.9
Standpipe (n = 83)	71.1
Surface water sources operators (n = 130)	68.8
Groundwater sources operators (n = 155)	49.3

Table 7.18 shows that there is no marked difference between the perception of water quality between the standpipe and house connection users, however, overall consumers on District Assembly managed system are showing a relatively higher satisfaction of

their water quality than recorded for the other models. In terms of raw water sources, consumers reliant upon surface water sources operators show a higher satisfaction of their water quality than those relying upon groundwater sources operators, posing another challenge to sector planners when groundwater sources are being considered for development as raw water sources.

7.5.2 Customer satisfaction of the hours of flow of water in a day

In all small towns except Salaga (C) and Damongo (DA) customers use house pipes, neighbours' house pipes and standpipes as sources of water from the operator. Customers who depend on the standpipes have access only when the commissioned vendors are at work and the level of this service varies from one town to another and the so the satisfaction of the consumers is not also the same. In Chapters Four, Five and Six the reported hours of flow of the individual operators were presented. In this section consumers' perceptions of these times are investigated.

In Figure 7.11 below, only Bekwai (Pv) and Sogakope (Pu) have recorded customer satisfaction with respect to the hours of flow of water in a day above 75% with Asiakwa (C) reporting about 70% of the household satisfied. The rest of the towns have customer satisfactions of between less than 8% in Atebubu (Pv) and less than 45% in Damongo (DA). Hours of flow of water in a day measures the quality of service received by households in the small towns and directly influences demand for water from the service providers. When the hours of flow of water is not reliable, customers are likely shift to alternative sources for household supplies or simply consume less. The revenue loss to the provider should be recognised by that provider.

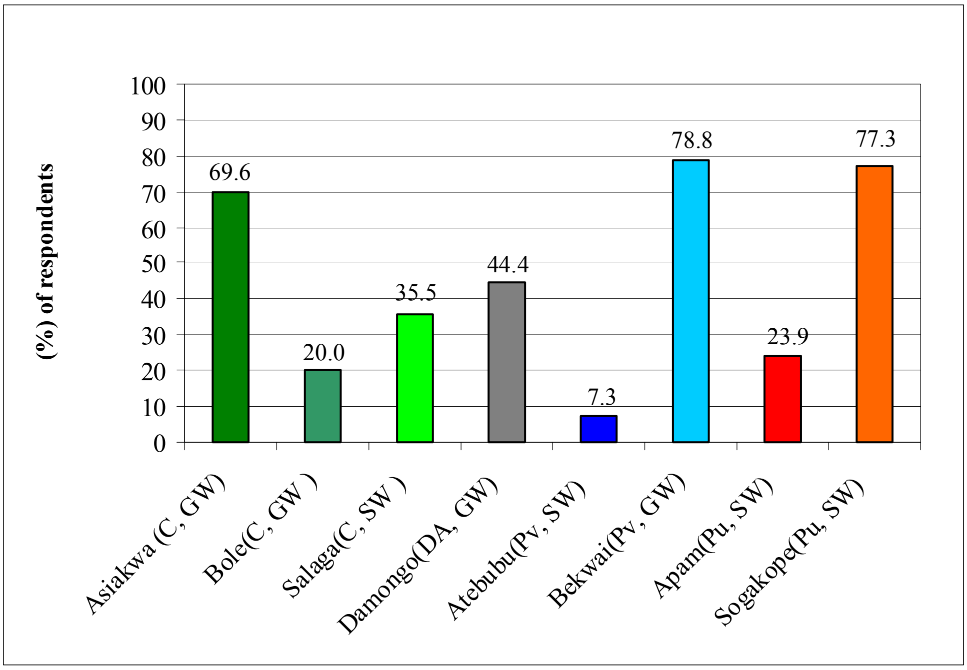

Figure 7.11 Percentage of households surveyed who are satisfied with the hours of flow of water in a day

Table 7.19 Satisfaction of hours of flow of water provided by operators by the different user groups

User groups	%
All water supply users (n = 152)	55%
Community managed (n = 81)	42.0
Private operator managed (n = 105)	47.3
Public utility managed (n = 68)	41.2
District Assembly managed (n = 31)	44.4
House connection (n = 57)	52.6
Standpipe (n = 83)	56.7

Table 7.19 shows that the standpipe users who receive water only at the times the vendors operate are more satisfied with the hours of flow of water in a day than the house connection users. The reason for the standpipe users perceiving the hours of water cannot readily be ascertained but as some respondents in Bole indicated: they have come to be used to the hours water flow and have adjusted themselves to it. This case though not enough to make a generalisation could possibly be one of many reasons for the score.

7.5.3 Customer satisfaction of water pressure in the taps

Households in Bekwai (Pv) and Sogakope (Pu) have recorded customer satisfaction of water pressure of more than 80% with Asiakwa (C) and Damongo (DA) following with about 74% and 52%. This indicator is a function of the maintenance of the water supply systems and low pressure in taps results in lower volumetric flows which in turn increases the waiting time at pipes generating possible queues in towns with high population. When taps register long queues there is again a likelihood of households turning to the alternative sources of water.

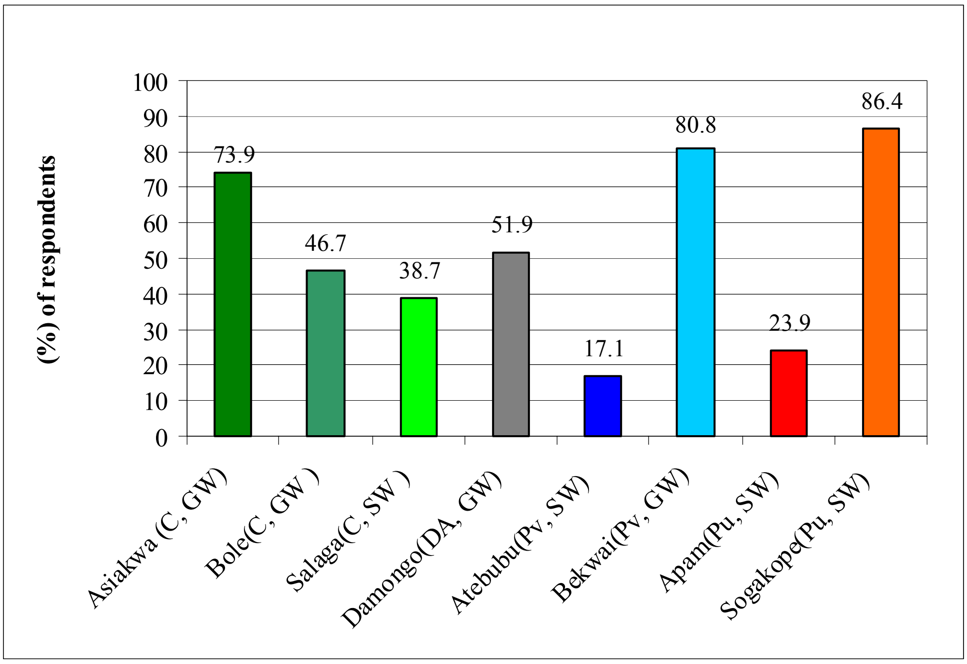

Figure 7.12 Percentage of households surveyed who are satisfied with the water pressure at their taps

Table 7.20 Satisfaction of water pressure at the taps of operators water systems by the different user groups

User groups	%
All water supply users (n = 152)	63%
Community managed (n = 81)	52.2
Private operator managed (n = 105)	52.7
Public utility managed (n = 68)	44.1
District Assembly managed (n = 31)	51.9
House connection (n = 57)	59.6
Standpipe (n = 83)	67.5

Overall, among the different management models, there is not much difference in the customer satisfaction of water pressure for Community, Private and District Assembly managed systems where more than 50% are satisfied. On the other hand, customer satisfaction is below 45% in Public utility managed systems.

7.5.4 Customer satisfaction of how complaints are handled

Handling of customer complaints is said by some to be as important as trying to provide quality service. In competitive businesses it is suggested that where a problem leading to a complaint occurs for a second time, there is nothing that the business can do to satisfy such a customer and in all likelihood, that customer will be lost forever (Michel et al., 2008). In small towns where there is a different type of competition as to where households should draw their water, it is important for the operator to seek to obtain some level of satisfaction of households in how their complaints are being handled, even where there is no alternative formal provider. Poor satisfaction is suggestive of customers' confidence (probably household connection customers predominantly) diminishing and likely move towards reliance on the alternative sources of water to provide for their household consumption, thus reducing operator's revenue.

Figure 7.13 below shows the percentage of households surveyed who are satisfied with the way their complaints are handled by the service providers in eight small towns in Ghana.

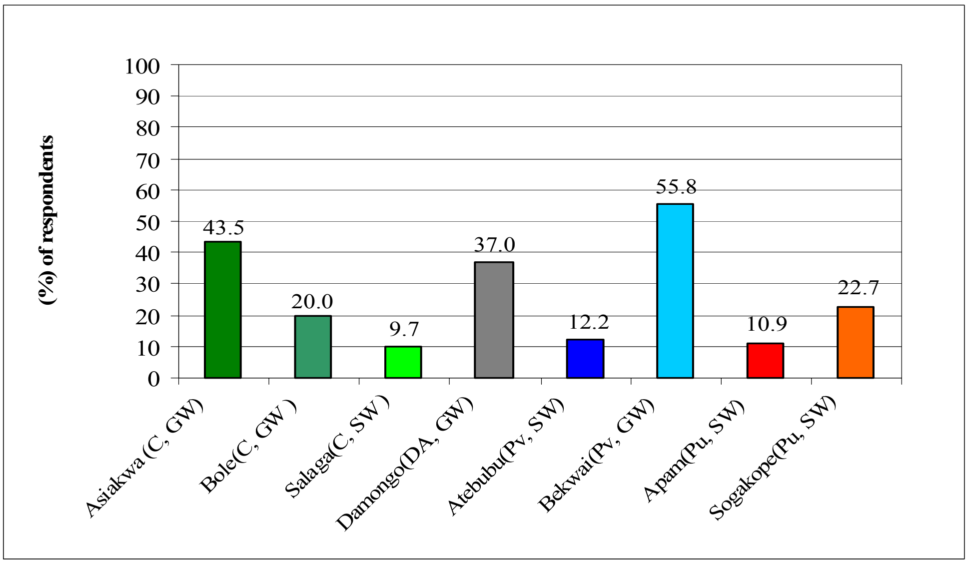

Figure 7.13 Percentage of households surveyed who are satisfied with the way complaints are handled

Overall more operators received unimpressive customer satisfaction score for the way complaints are being handled relative to the other five indicators. This is an indication of weakness of the operators to respond promptly and appropriately to their customers' complaints. In all small towns, except Apam (Pu) and Sogakope (Pu), complaints about the service are lodged either with the operators or WSDB or in some cases the District Assembly. Bekwai (Pv), which performed better with customer satisfaction of almost 56%, has an advantage of having the operator and the WSDB sharing the same office block. It was indicated in the subjective capacity descriptions section in Chapter Five that the customers trusted the operator in Bekwai (Pv) to be able to handle their water issues but in Atebubu (Pv) the customers turn to the District Assembly when they have problems with water. This state of trust of the two private operators by their customers has been reaffirmed further here. In Salaga (C) the operator does not have an office, therefore does not have a permanent location where customer can lodge their complaints. The operations of the Apam (Pu) water supply, being supervised by the operator of the Winneba water system located about 25km away, are difficult for customers to lodge complaints. Salaga (C) and Apam (Pu) from the figure above are the two operators with least customer satisfaction followed by Atebubu (Pv).

The overall customer satisfaction of complaints handling with regard to the four management models and by house connection and standpipe users are shown in Figure 7.11 below.

Table 7.21 Customer satisfaction of complaints handling by operators by the different user groups

User groups	%
All water supply users (n = 152)	33%
Community managed (n = 81)	23.2
Private operator managed (n = 105)	36.6
Public utility managed (n = 68)	14.7
District Assembly managed (n = 31)	37.0
House connection (n = 57)	24.6
Standpipe (n = 83)	41.0

Table 7.21 above shows that none of the management models was scored up to 40% on complaints handling and for house connection and standpipe users, standpipe users are more satisfied than the house connection users. In addition to the stated places where complaints are made for each operator, the standpipes users have the vendors to make complaints to for solutions and that might be one of the possible reasons for the relatively higher score.

7.5.5 Customer satisfaction of queues at the water points

When long queues are found at water points households spend a longer time making the round trip in search of water even if the distances from the households places of dwellings to the water points are short. Queues at the water points may serve as an incentive for households to turn to alternative sources for water. Queues at water points in small towns, which are indicative of limited service quality, result from three factors either separately or a combination of all. When hours of water flow are unreliable households rush to water points anytime water is flowing, creating queues at the water points. This situation is aggravated when water rationing is being practiced in the towns. In Atebubu (Pv), it was observed that even when water was not flowing, there were queues of empty water containers, stones and other material at the stand pipes. The second factor that causes queues is when the water points (house connections and stand pipes) are fewer than what might reasonably be required to serve the population. A third factor relates to the pressure in the system and the consequent flow at the stand pipes where filling a container might take longer than is considered reasonable. The customer satisfaction of the queues at the water points by towns is shown below.

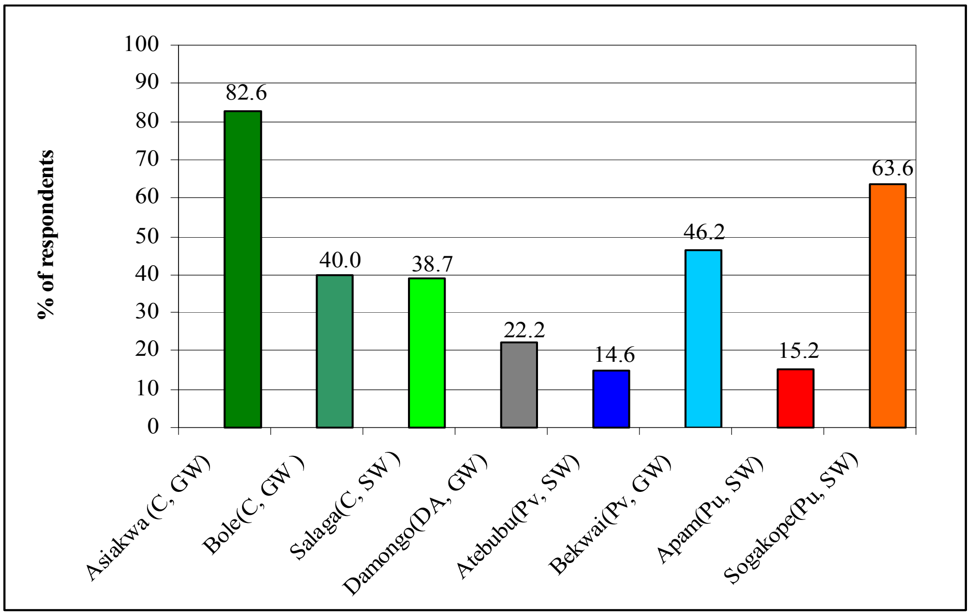

Figure 7.14 Percentage of households surveyed who are satisfied with the queues at their water points

Figure 7.14 above shows that in Atebubu (Pv) and Apam (Pu) customers have rated the queues at their water points poorly at about 15% satisfaction and by aggregating this satisfaction scores by management models the community managed systems scores highest with a satisfaction score of 53.6%. The rest of the scores of the management models and by house connection and standpipe users are captured in Table 7.22.

The District Assembly model in Damongo scored least on this measure because, with only a few water points in town, households, the author was told, fill all available household containers before the next person can have access creating long queues as a result of the long waiting times. The operator indicated he cannot control that as consumers are not prepared to obey any rule in that regard.

Table 7.22 Customer satisfaction of queues at water points provided by operators by the different user groups

User groups	%
All water supply users (n = 152)	47%
Community managed (n = 81)	53.6
Private operator managed (n = 105)	32.3
Public utility managed (n = 68)	30.9
District Assembly managed (n = 31)	22.2
House connection (n = 57)	66.7
Standpipe (n = 83)	36.1

7.5.6 Customer satisfaction of water tariff

In Chapters Four, Five and Six the water tariff charged by each of the operators was investigated, showing that in most cases tariffs are below what is required to ensure financial sustainability of the operations of the water supply systems. Despite that, households in the majority of the towns are not satisfied with their current water tariffs with satisfaction score of less than 45% as shown in Figure 7.15. The long years of small towns not paying for their water supply services (World Bank, 1994) might be a contributing factor to this development. The operators therefore face a massive challenge in generating the needed revenues to manage the water supply systems sustainably. Part of this challenge is for the operators to engage with their customers within their community context, explaining their own role and the necessity for tariffs (or more formalised government subsidies) and also the benefits of this improved water supply.

In Salaga (C) where about 65% of households surveyed indicate they are satisfied with the water tariff, consumption charges are made irrespective of the number of people in a house or the volume of water consumed. This is clearly a pattern which households appreciate in Salaga and is of wider interest as it was also the pattern at the commencement and even long-term development of water supply in now high-income countries. Perhaps it is not appropriate to be expecting to meter all consumption (at considerable additional cost) in small towns.

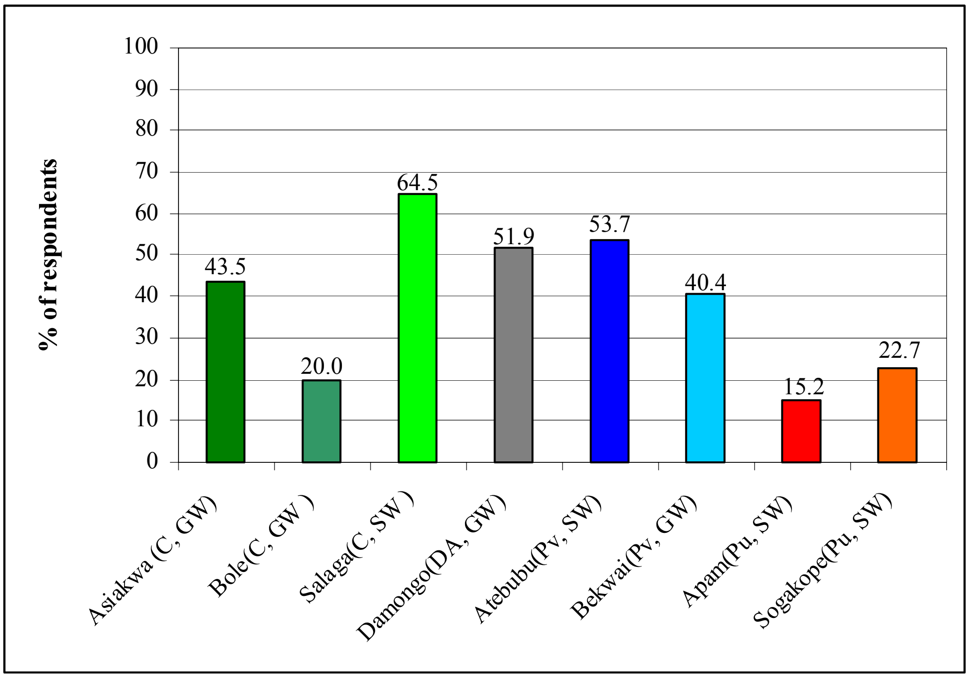

Figure 7.15 Percentage of households satisfied with the water tariff of the operator

Determined by management models, District Assembly managed model scored the highest satisfaction of the water tariff with a score of about 52%. The scores of the rest of the management models are included in the table below.

Table 7.23 Customer satisfaction of water tariff of operators by the different user groups

User groups	%
All users of water systems (n = 152)	35.5
Community managed (n = 81)	47.8
Private operator managed (n = 105)	45.2
Public utility managed (n = 68)	17.6
District Assembly managed (n = 31)	51.9
House connection (n = 57)	38.6
Standpipe (n = 83)	39.8

Table 7.23 shows that despite the fact that households who resort to standpipes for their water supply being less wealthy and pay more for water than those using house connection the customer satisfaction of both user groups are about the same, with the standpipe users showing a slightly higher score. This could probably be one of the reasons why operators in the towns continue to charge higher tariff per cubic meter of water at the standpipe than at the house connection. Similar to the willingness to pay more, satisfaction of the water tariff does not reflect per capita incomes.

It has been established from the ANOVA tests that indeed there are significant differences in the small towns with respect to the distances from households' places of dwelling to their water sources, the round trip times households make in search of water, household sizes and the households' expenditures on water, electricity and mobile phones. As per capita water consumption, households' expenditure on water, distances from households' places of dwelling to their water sources and round trip time in search of water are factors that have implications with respect to the performance of the different management models, ANOVA test was conducted on the factors based on the management models. The results of the ANOVA tests based on the management models with respect to the stated factors are shown in Tables 7.24, 7.25, 7.26, 7.27 and 7.28 below. The decision explained in Chapter three is applied where the null hypothesis (H_0: $\mu_0=\mu_1=\mu_2=.......=\mu_8$) is only rejected when $F \geq F_{cricitcal}$.

Table 7.24 ANOVA results for per capita water consumption in litres/person/day

Source of Variation	*SS*	*df*	*MS*	*F*	*P-value*	*F crit*
Between models	153.01585	3	76.507926	0.5246337	0.5924879	2.640281
Within models	33103.669	281	145.83114			
Total	33256.684	284				

Table 7.25 ANOVA results for distances from households' places of dwelling to their main water sources

Source of Variation	*SS*	*df*	*MS*	*F*	*P-value*	*F crit*
Between models	0.204383	3	0.1021915	2.1730682	0.1161902	2.640281
Within models	10.674985	281	0.0470264			
Total	10.879368	284				

Table 7.26 ANOVA results for distances from households' places of dwelling to their alternative water sources

Source of Variation	*SS*	*df*	*MS*	*F*	*P-value*	*F crit*
Between models	2.9270179	3	1.3538811	2.4699595	0.0714298	2.640281
Within models	124.42755	281	0.548139			
Total	127.35457	284				

Table 7.27 ANOVA results for round-trip time in search of water for household

Source of Variation	*SS*	*df*	*MS*	*F*	*P-value*	*F crit*
Between models	10117.26	3	1981.5649	2.261246	0.3586388	2.640281
Within models	198923.63	281	876.31554			

Total	209040.89	284				

Table 7.28 ANOVA results for household expenditure on water/month

Source of Variation	*SS*	*df*	*MS*	*F*	*P-value*	*F crit*
Between models	1752.115	3	325.81166	2.3684797	0.2037104	2.640281
Within models	31226.456	281	137.56148			
Total	32978.571	284				

The ANOVA results of the management models ($F < F_{critical}$) show that though the towns have significant differences between them the management models are not significantly different an indication that the individual socio-economic-physical characteristics of small towns are more relevant in explaining variations in the provision of water supply services to the inhabitants than any particular management model.

7.6 Chapter summary

In the chapter it has been established that in all eight small towns households depend on multiple sources of water with that dependency varying between the rainy season and dry season. In all eight towns it was established that the average distances between dwellings and alternative sources of water are longer than to the water sources provided by government agencies - which should favour the formal and better water quality, supplies. It was also determined that in all the small towns the average per capita combined water consumption was approximately 25 litres per person per day, just above the 20litres/person/day and well below 60litres/person/day consumption levels considered basic for stand pipe and house pipe users respectively. The small difference between per capita water consumption of house connection users and standpipe users questions the basis for the 60 litres/person/day 'DRA consumption' used in design of house connections when an average of only 26litres/person/day was recorded in the survey.

It has been shown that between water, electricity and mobile phone usage, households spend significantly more of their income on mobile phone usage and least on water. On average, households spend as much as three times and two times annually on mobile phone usage and electricity as on water respectively. Willingness to pay more for water if the current services were improved depended on what customers perceive the current level to be and not whether the increases are affordable or not.

More households in the eight small towns are more satisfied with the water quality from the service providers than the hours of flow of water per day, water pressure in taps, complaints handling, queues at water points and water tariff with complaint handling and water tariff rate least.

It has been shown in the chapter that the towns populations are different in many respect by the ANOVA results, providing the evidence that small towns in Ghana are perhaps more diverse than normally assumed. It has been shown also that there are no significant differences between the management models with respect to the factors that impact on the management models being adopted in the small towns in Ghana.

The extent to which these levels of consumption, payment and satisfaction relate to the different models of service operator management is the issue to be addressed in the final discussion chapter.

CHAPTER EIGHT

8 The search for the sustainable water supply management model in small towns in Ghana

"Efficiency is doing things right; effectiveness is doing the right things" Dr Peter Drucker (1909 – 2005)

8.1 Introduction

In this chapter the performance of the four management models adopted in small towns is discussed, relative to the household data presented in Chapter Seven under the sub-objectives of the research. The performance indicators discussed in Chapter Two, which formed the basis for the results presentations in Chapters Four, Five and Six have been realigned in this chapter to reflect the research objectives. In discussing the vital issues contained in the objectives, this chapter also compares the performance of the four different management models to establish if, to any discernible extent, any one model is better able to deliver sustainable water supply services in line with targets provided by CWSA or consumers' surveyed demand. It can be recalled that presentation of the results of the water supply operators in Chapters Four, Five and Six did not provide any discernable trends from the three years data but did enable 'one-off' events to be recognised. Therefore to make this comparison properly, and provide meaning to the data, only averages of the three years (2005, 2006 and 2007) of the operators' data are used for the discussion in this chapter. The averages of the three years of data of the operators in the eight small towns provide an additional benefit when comparing the operators' data to households' data on water supply. As the demand responsive approach was to ensure effective service delivery, effectiveness criteria are extensively discussed in the chapter.

The chapter is structured with:

Section 8.2 Summary of performance results

Section 8.3 Discussion of key issues arising from performance results

8.2 Summary of performance results from previous chapters

This section summarises the results of Chapter Four, Chapter Five, Chapter Six and some parts of Chapter Seven that relates operators' performances within the context of the literature and insights gained during the research. Based on comparative analysis this section summarises the performance of the four management models investigated in the eight small towns based on the following set of decision criteria:

Effectiveness of service delivery

1. Service coverage is considered effective if 100% coverage is attained by operator;
2. Per capita water consumption is equal or less than per capita water supplied by operators;
3. Annual interruptions are not more than 5% of all the days in a year, this being in line with CWSA requirement;
4. The majority of the towns' population (less than 50%) are not satisfied with service delivery. As sensitivity analyses carried out show that the operators were not scored particularly high, consumer satisfaction of not less than 50% is found appropriate for this analysis. Since consumer satisfaction was elicited on six elements, any of them is scored one sixth (1/6) score.

Equity in service delivery

1. Tariff at standpipe equal to tariff at house connection;
2. Hours of flow at standpipe equal to hours of flow at house connection.

Financial sustainability of service delivery

1. Average tariff not less than full supply cost;
2. Operating expenses not more than operating revenues;
3. Households' expenditure on water not more than 5% of their incomes.

Efficiency of service delivery

1. Unaccounted for water not more than 15% of water production (this also measures environmental sustainability of raw water usage);

2. Staff productivity index not more than one staff per 2000 persons served by the water system;
3. Bill collection efficiency not less than 85%;
4. All connections metered (i.e. 100%);
5. Subjective capacity descriptors above the average of 3. Similar to the scoring on customer satisfaction, with six subjective capacity descriptors any of them is scored at one sixth (1/6) if above the central score level.

In Table 8.1 below each decision criteria stated above is matched against the performance of each of the eight operators and when the operator satisfies the criteria a 'X' is made. The number of 'X's are therefore summed up and operators with a higher number are considered to have been performing better. In scoring the performances of the operators the averages of the three years of data (2005, 2006 and 2007) were used.

This relatively simplistic approach to aggregating performance scoring is believed to be appropriate to the quality of the performance data obtainable from the service providers, a function of investigating small towns water supply. If more sophisticated and accurate performance indicators had been available and researchable the author would have considered the use of Data Envelopment Analysis.

With regard to the subjective capacity descriptors, overall the operators did not perform well with average score for all operators recorded as 2.4 for leadership, 2.6 for organisational autonomy, 2.3 for management and administration, 2.4 for commercial orientation, 2.0 for customer orientation and 2.4 for organisational culture. As much as these scores are subjective they are however revealing. Customer orientation, which is, or should be, an important feature of a Demand Responsive Approach, scored least. This is because operators in all eight towns are not following the rules laid down. Customers are not consulted in any decision making with the excuse that the WSDB are representative of the communities. By inspection of the subjective capacity descriptor scores in Chapter Four, Chapter Five and Chapter Six together with Table 8.1 shows that there seem to be a relationship between the performance rankings and leadership, performance ranking and commercial orientation.

Table 8.1 Summary of performance of eight small towns water system

Performance Indicator	Asiakwa (Community)	Bole (Community)	Salaga (Community)	Damongo (District Ass.)	Atebubu (Private)	Bekwai (Private)	Apam (Public)	Sogakope (Public)
Effectiveness of service delivery								
1. Service coverage								X
2. Per capita consumption								
3. Annual interruptions	X			X		X		X
4. Consumer satisfaction								
- Water quality	1/6X	1/6X	1/6X	1/6X	1/6X	1/6X	1/6X	1/6X
- Water availability/day	1/6X					1/6X		1/6X
- Water pressure	1/6X			1/6X		1/6X		1/6X
- Complaints handling						1/6X		
- Queues	1/6X							1/6X
- Water tariff			1/6X	1/6X	1/6X			
Equity in service delivery								
1. Tariff (SP = HC)	X							
2. Hours of flow (SP = HC)		X	X					
Financial sustainability								
1. Average tariff not less than full cost of supply						X		
2. Operating expenses not more than operating revenues	X			X		X		
3. Not more 5% of household income spent on water		X	X		X	X	X	X
Efficiency								
1. Unaccounted for water not more 15%	X			X				
2. Staff productivity index not more than one staff per 2000 people				X			X	X
3. Bill collection not less than 85%								
4. All connections metered				X		X		
5. Subjective capacity descriptors	X			X	X	X		
- Leadership								
- Organisational autonomy	1/6X					1/6X		1/6X
- Management & admin	1/6X			1/6X	1/6X	1/6X		
- Commercial orientation	1/6X					1/6X		
- Consumer orientation	1/6X					1/6X		
- Organisation & staff cult	1/6X					1/6X		
	1/6X					1/6X		
TOTAL SCORE	**6.67/14**	**2.17/14**	**2.33/14**	**6.67/14**	**2.50/14**	**7.67/14**	**2.17/14**	**4.84/14**
RANK	**2**	**7**	**6**	**2**	**5**	**1**	**7**	**4**
Rank Surface & Groundwater	**2**	**4**	**3**	**2**	**2**	**1**	**4**	**1**

Considering all 285 respondents, the overall consumer satisfaction of water quality was recorded as 69%, water availability/day was 55%, water pressure at taps was 63%, complaints handling was 33%, queues at water points was 47% and water tariff recorded 35% . These satisfaction scores work out to an average of 50%. Again when a 40% score is considered as acceptable the number towns receiving 'X' reduces slightly when the level is raised to 50% but the number drops sharply when the level is raised further to 60%. Therefore a satisfaction of 50% cut-off level was considered fair in judging the acceptable consumer satisfaction level and this was used to score the operators in Table 8.1 above.

The analysis of variance (ANOVA) tests conducted show that there are significant differences between the eight towns with respect to the distances from households' places of dwelling to their water sources, the round trip times households make in search of water, household sizes and the households' expenditures on water, electricity and mobile phones. These significant differences have provided the evidence that small towns in Ghana are more diverse than often realised. However, ANOVA tests conducted on the samples based on the management models show no significant differences between the management models in terms of the per capita water consumption, households' expenditure on water, distances from households' places of dwelling to their water sources and round-trip time in search of water. Per capita water consumption, households' expenditure on water, distances from households' places of dwelling to their water sources and round trip time in search of water are factors that have implications with respect to the performance of the different management models. It appears therefore that the individual socio-economic-physical characteristics of small towns are more relevant in explaining variations in the provision of water supply services to the inhabitants than any particular management model. This explanation confirms the results in Chapters Four, Five and Six, summarised in Table 8.1, where the same management model adopted in different towns provided different performance results.

8.3 Discussion of key issues arising from performance results

Comparing the performance of all eight operators relative to the four management models suggests that none of the operators can be said to be delivering sustainable water supply in terms of the criteria discussed in Chapter Two. The analysis shown in Figure 8.1 indicates that of the 14 different performance indicators considered Bekwai (Private) performed best with a total score of 7.67, followed by Damongo (District Assembly) and Asiakwa (Community) with equal scores of 6.67. In analysing the performance of the operators the research has noted the complexities in small towns water delivery.

The results show that coverage figures are generally low relative to the population of the towns and that in most of the cases the operators have not expanded their facilities to cover the unserved areas despite the rapid population growth rates recorded in their towns. However the current volume of water supplied by operators to consumers if not increased will reduce further the low per capita water consumptions recorded if coverage was to increase. When consumers are not adequately served by the formal service providers they will return to the use of the available alternative sources. Increasing water facilities to have larger capacities to serve the increasing demands by consumers will come with the challenges of generating revenue to match up the investments and charging cost reflective tariffs. It has been shown that financial positions of households are not necessarily the determinants of use of the improved water systems. The households who depend on the alternative sources of water have higher per capita incomes than those using stand pipes.

The implementation of water projects in Ghana, from the results in Chapter Seven, do not follow the principles of the demand responsive approach as described in the literature but rather have been implemented based on the country's understanding of the principles of demand responsiveness. There is little evidence therefore of any of the towns following a demand responsive approach in its true sense to water services. To access funding they have followed a 'Demand Responsive Approach' which appears to have little to do with effective demand.

Household demand for water supply across the different user groups, across management models and geographical locations has been found to be similar in Ghana but very low with an average of 24.6litres/person/day. Considering the huge investments and the resources required for both recurrent and capital maintenance such levels of consumption are unlikely to provide sufficient revenue, particularly if based upon a volumetric tariff, to support sustainable services directly.

The government and donors are left with limited options of whether to provide small towns water systems to be able to cope with the high population growth rates to ensure adequate coverage to meet the MDG targets but then necessarily supporting them with additional and ongoing resources for operations. Or to provide a level of service adequate for supplementing dry season consumption, when alternative sources fail, and to return in the future with limited, cost-effective support to expand the facility only as is needed to match the growing population. Alternatively they could begin to enable service providers to follow a real demand responsive approach. Any decision to be made should however recognise the responsibility of government to ensure better health outcomes for the people, as contained in the NCWSP objectives and MDG targets.

The evidence uncovered by the research suggests that any attempt by operators to increase tariffs to deliver the revenues needed to cover the cost of water supply, in order to ensure the financially sustainable service delivery that is currently perceived to be the major challenge, poses another challenge. Despite the fact that all small towns in which the operators were investigated are showing water consumption higher than ‘basic’, a considerable amount of it comes from alternative sources of water. Therefore increasing tariffs could lead to a reduction in demand, especially among the standpipe users who are already paying relatively higher tariffs and constitute the poorest among the user groups from the household income analysis. The possible consequences of any further reduction in demand are decreased revenues and even more limited capital maintenance with the sustainability of the systems being yet further challenged. This research therefore questions how the NCWSP intended to achieve its objective of ensuring sustainability of small towns water systems through Community Ownership Management without adequate financial support to the small towns?

Evidence from consumers in the small towns has shown that significantly more is spent on other services such electricity and mobile phones than water, an indication of a possibility of cost reflective tariff for water supply where there is actual willingness to pay. Analysis of the proportion of household income spent on water, their willingness to pay more if their current services were improved and consumer satisfaction with the current tariff indicates little if any consistency in demand at present.

Table 8.2 Comparison of households' willingness to pay more if the current service level were improved and households satisfaction of the current water tariff

	Household income spent on water (%)	Willingness to pay more if services were improved (%)	Consumer satisfaction of water tariff (%)
Asiakwa (C)	6.0	42.5	43.5
Bole (C)	2.0	86.7	20.0
Salaga (C)	2.7	90.3	64.5
Damongo (DA)	8.4	88.9	51.9
Atebubu (Pv)	5.0	61.0	53.7
Bekwai (Pv)	2.9	48.1	40.4
Apam (Pu)	4.0	63.0	15.2
Sogakope (Pu)	2.5	54.5	22.7

In order to ensure better health outcomes in these small towns through improved water supply, this research suggests that government will need to provide regular financial support for the operations of the water systems. The donor consensus regarding locally sustainable water systems through the Demand Responsive Approach may well be invalid.

This research has evidence, shown in Figure 8.1 below, that the source of raw water has significant implications on full supply cost of water; a necessary component in determining cost reflective tariff, therefore consideration should be given to a choice of source when developing new water systems in small towns. On average from the analysis it costs US\$2.8/m^3 as full supply cost using surface water as the source, US\$0.85/m^3 using ground water as the source. In almost all cases, it can be assumed that designers will only have implemented surface water schemes where groundwater sources are considered inadequate for hydrogeological reasons. The other challenge of households not being satisfied with water from groundwater sources should not also be lost as the analysis of consumer satisfaction on water quality has shown. It has also been shown in Table 8.1 that out of the best four performing water systems, only one depends on surface water as the source of water and that was the least performer among the four systems.

Providing cost effective water supply services can be suggested as being at the centre of the retention of some small towns water supply systems by the GWCL at the inception of the NCWSP and the choice of small towns to be managed by private operators. All the small towns water systems retained by GWCL were either recently rehabilitated and therefore were perceived not to demand much maintenance costs, or plans were advanced for donor support rehabilitations. Analysis of the household data has supported the argument that small towns being operated by the public utility were those generating adequate revenues in terms of water sales as they have recorded higher per capita incomes than the others. In introducing private operators in the direct management of small towns water systems towns with population above 20,000 inhabitants were selected, as that population threshold was considered at the time as one that could provide the needed revenue for system maintenance.

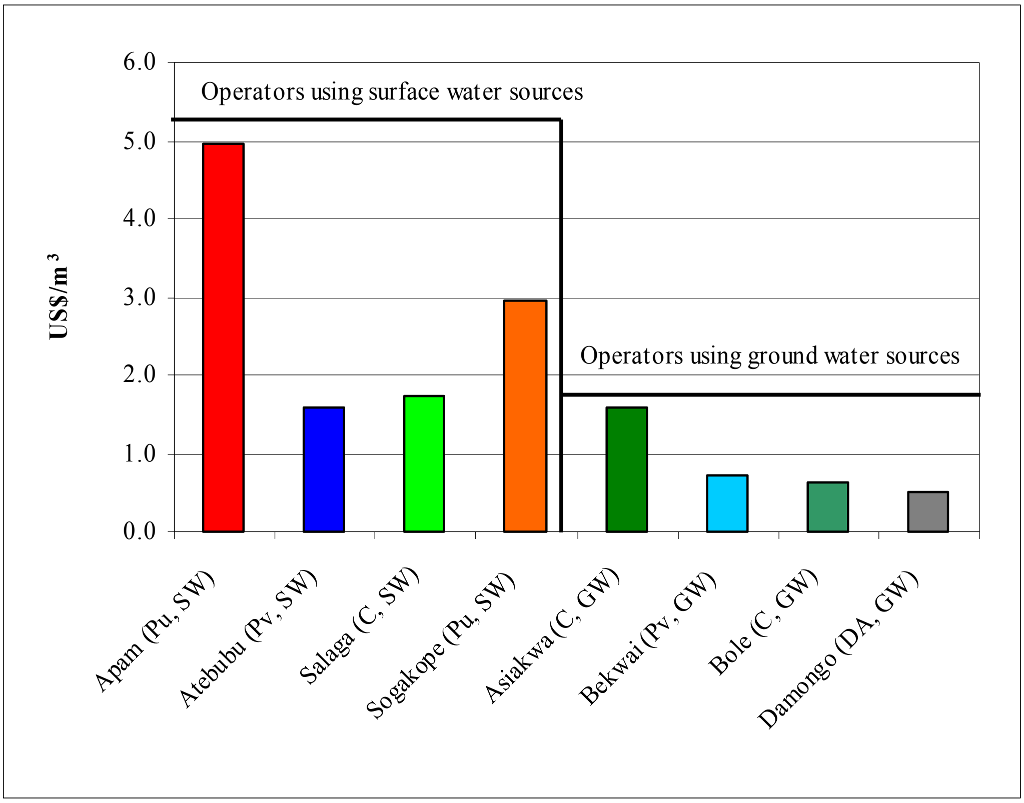

Figure 8.1 Comparison of full supply costs and source of raw water for the different operators

It is possible to average the summary performance scores for the eight towns relative to groundwater sourcing (5.8) or surface water sourcing (3.0). The performance aggregation is not unduly weighted towards any cost differential. However there is such a significant difference in the overall performance relative to the water source that it might be presumed that the additional costs of surface water treatment are so debilitating financially that possible advantages of any provider model are unable to overcome this initial burden.

Where there is no alternative than to supply consumers through more expensive surface water systems, in the context of limited economic wealth and limited demand for improved services in small towns, there may well be a case to be made for external support to enable bulk water delivery to the towns, sustainability criteria then only needing to apply to water distribution.

CHAPTER NINE

9 Research conclusions and implications

9.1 Introduction

This chapter presents the conclusion to the research, developed from the presentation of the background to the challenges to enabling continuing water supply services to consumers in small towns in Chapter One. Chapter Two provided the detailed background and overview of developments in small towns water supply delivery in general, developing into the research objectives. In Chapter Two also, detailed issues of sustainable water supply delivery and approaches to performance measurement and management were considered. Based on the research objectives, Chapter Three presented the methodology and the step by step procedures adopted in collecting the relevant data from the eight small towns with their four different management models. The data collected were analysed based on the management models and the results presented in Chapters Four, Five and Six. In Chapter Seven results of household data to determine how household express their demand was presented. In searching for which management model, if any, is providing sustainable, or perhaps ‘more likely to be sustainable’ water supply services to small towns in Ghana a comparison of the four management models represented by the eight small towns was undertaken in Chapter Eight. In this concluding chapter, the overall conclusion on the research problem and objectives are made. The implications of the research findings for policy and practice, methodology and for further research are also made in this chapter. The major limitations that became apparent during the progress of the research have also been reflected upon.

9.2 Conclusions about the research problem

Providing sustainable water supply to inhabitants of small towns in Ghana as discussed in Chapter One focused mainly on the institutional set up of operators. This has been a key area of debate in the sector over the past two to three decades. This research therefore investigated the management models to ascertain to what extent they are delivering sustainable water supply services to the population within the context of effective demand for water by consumers. Taking advantage of the unusual variety of models being used in any country at one time, the research investigated the four models in use from eight small towns spread across Ghana. It has been established that, though the different management models on the average perform relatively differently, the Private operator in Bekwai performed relatively best, followed by the Community operator in Asiakwa and District Assembly operator in Damongo. On the other hand the Community operator in Bole and the Public utility operator in Apam performed least. However the “best” performance recorded by the Private operator in Bekwai is short of delivering sustainable water supply services to the people.

The inability of the operators in these small towns to deliver sustainable services to the people is the result of challenges such as low revenues due to limited demand, higher supply costs in the case of operators using surface water and the continuing availability of alternative, ‘free’, sources of water. The situation is ongoing as it appears that implementation strategies for small towns have not considered the extent of these challenges. In view of the aforementioned, the demand responsive approach appears not to be successful in the context of small towns in Ghana.

The research conclusions, drawn from the sub-objectives, are:

1. *Determine the level of service provided to consumers in small towns by local services , considering the overall effectiveness and equity in access by different groups of consumers.*

Based upon the information presented in earlier chapters, none of the management models is delivering effective and equitable services to consumers.

2. *Determine the financial sustainability of small towns water supply by analysing the financial performance of the formal service providers.*

Among the four management models investigated, no particular one was established to be generating revenue to meet the full cost of supply and therefore either no funds are accumulated in the replacement account or the amount in the account does not reflect the estimated amount. In fact none of the management models is generating sufficient revenue to cater even for operating expenses.

3. *Determine the efficiency of service delivery by the different patterns of formal providers.*

On all four efficiency indicators the District Assembly managed model has been found to be efficient, operators within the other management models were found individually to be efficient in some with two of the operators, in Bole (community) and Salaga (community), found not to be efficient in any of the indicators. On the efficiency of service delivery as set out by this research only the District Assembly managed model can be set to be delivering efficient services to the consumers, this must however be considered within the context of having only one operator in the District Assembly managed model.

The objective to investigate the management models in use in small towns with respect to effectiveness, equity, financial sustainability and efficiency in water supply services delivery has therefore been realised in the finding that no one approach to management can be said to show any significant advantages. Enabling appropriate leadership is more important than any single model and no one model appears to be able to deliver sufficient space consistently to facilitate that leadership. The overwhelming influence of the water source appears to crowd out any management effect.

The second objective was to investigate households' demand for improved water relative to alternative sources of water, to determine what effect this aspect of small town water supply was having. Reflecting on those sub-objectives:

1. *Considering what households demonstrate with regard to demand responsive approach by their actual access to improved water and their willingness to pay for other services.*

The provision of water supply to small towns appears to be based on a top-down, supply driven presumption regarding demand for improved water supply services whereas the provision of mobile network services are based on market forces. With annual GDP/capita figures of US$715.59 (Table 1.1, 2008) and the average annual per capita income of all the small towns determined as US$423.69, households are spending on average US$265.2 on mobile phone usage, US$145.0 on electricity and US$124.7 on water per year. Of all users of the water systems only about 36% indicated they were satisfied with the water tariff. In addition Table 8.2 shows that there is no observable trend between consumers' willingness to pay more if services were improved and the consumer satisfaction of the current tariff. The use of the improved water system seems not to be dependent on households' income considering the alternative water source users who have recorded higher per capita incomes than those using the stand pipes. Therefore the real willingness to pay more is minimal.

2. *Investigate the extent to which alternative sources of water are being used by consumers*

Overall in the small towns, 22% of households depend on the alternative sources of water for 100% of their supply, recording higher per capita consumption than stand pipe users. This represents potential consumption and therefore revenue that the operators would have found useful to improve their financial performance. Consumer satisfaction with the service is not particularly high, apparently not sensitive to any management model and definitely not high enough to reduce the use of alternatives.

The research has shown that none of the management models is effective, equitable, financially sustainable and efficient in delivering water supply services. It has also shown that households have demonstrated that demand for water supply is low and demand for water supplied by formal operators is even lower.

The research has provided some understanding to small towns water supply to the effect that there are no significant differences on average between the management models – though leadership provided by the manager does make a difference.

The effect of water source, both in terms of cost and apparently in terms of human resources and capital maintenance requirements was not anticipated in the original research objective and appears to be more significant than both the management model and the limited demand.

With respect to demand, the research has found that water consumption is remarkably stable among different users, different towns, different sources and different delivery methods, with consumers only willing to spend a limited amount on any formal supply, except in the dry season.

Operating at a fairly limited level, operators are presently receiving external support through reliance upon the funds of District Assemblies for operation and maintenance expenditure, by defaulting on payments to suppliers, by deferring capital maintenance and by not having to make any contributions to the costs of capital employed and amortisation.

9.3 Implications for policy and practice

The findings of this research show that the demand responsive approach set out in the National Community Water and Sanitation Programme which was implemented in Ghana to deliver long term sustainability in water supply services in small towns is far from delivering the intended sustainable services.

Reflecting on the research problem, it can be concluded that full supply cost has been shown to be so affected by the source of water, surface water being about three times more expensive than groundwater, then this suggests that the management of water production could be decoupled from the management of distribution and selling, which would allow operators to focus on the more manageable aspects of genuinely demand responsive distribution with the high fixed asset costs, operating costs and professional human resource needs of surface water production and transmission to be transferred to either the national utility or regional bulk water entities.

9.4 Limitations of the research

Despite the research making a significant contribution to the understanding of the provision of water supply services in general and small towns in particular, the research encountered some limitations. Firstly, as the accounts of the majority of the operators were not audited for several years, authentication of the financial statements was limited to establishing consistencies and eliminating any discrepancies with continuing doubt as to some of the figures presented. Also as investment and supply cost analysis were based on project costs after completion, and there was no way the author could have verified whether the reported amounts reflects the true cost, their accuracies could have been affected by the reports.

Secondly, the differences that exist among consumers in terms of incomes, religion, social stature might have resulted in some variations in the data gathered which could involve some inaccuracies. However comparisons made with national and regional averages from the Ghana Statistical Service show that the data are similar enough.

Thirdly, the high illiteracy rate in Ghana, which necessitated the questionnaires to be interpreted in local languages, could have resulted in loss of precision in the meaning of questions due to lack of corresponding terminologies.

The willingness to pay survey was a limited one which was limited to eliciting the willingness to pay more if the current service was improved. Therefore the data cannot be used as if it was collected as part of a broader willingness to pay survey.

These limitations, though acknowledged in the research, do not, the author believes, detract the significance of the findings.

9.5 Implications for further research

The research has revealed a number of challenges confronting the operators of small towns water supply facilities and which suggest further studies by future researchers in this topic. Consumers still depend on alternative sources of water to a significant extent, despite the provision of improved water supply facilities. Also households are more willing to pay more for other services than for water. Considering the very importance of water to human existence, further research into what factors are critically important for motivating consumer decisions on water source choices and the willingness to use and pay for improved services in Ghana will enhance further the understanding of the psychology of consumers towards the facilities provided.

The effective demand for improved services, in the context of small towns access to resources, economic and professional, as well as the availability of alternative traditional sources require further investigation.

As the government of Ghana and its development partners consider whether to extend private sector participation in small towns water supply delivery, the need for further study into the nature and institutional framework for regulating small towns water supply in Ghana must be encouraged and considered as a matter of urgency. Vertical separation of responsibilities might be more important than varying the management model.

Finally, the level of design for the different population brackets of small towns whilst allowing a window for future expansion as the small towns make the transition into urban centres, needs further investigation.

9.6 Contribution to knowledge and conclusion

In the context of small towns, this is one of the few research projects whose conclusions are drawn from analysis based on both the operators ‘supply side’ activities and households’ ‘demand side’. This analysis therefore provides real insights into the underlying factors that need to be considered in the assessment of small towns water supply services. This needs to be adopted in any assessments of performance as it provides the balance between policy intents and realities.

The approach this research adopted has brought to the fore the challenges of small towns water supply delivery as a network of contradictory issues which will have to be assessed individually and together in fashioning future policy. In small towns in Ghana, charging cost reflective tariffs at present cannot deliver long term, sustainable water supply delivery, despite consumers having the ability to pay. This situation is at variance with the general water supply sector 'accepted wisdom' of the importance of cost reflective tariffs, an interesting contribution to the body of knowledge.

The research has also contributed towards an enhanced understanding of the limits to decentralisation in a low-income economy. There are tasks which are clearly within the capability and interests of a decentralised management system, whether public or private. There are other tasks, in this example bulk water supply from surface resources, which need the technical capability and access to specialised knowledge and equipment which can only come from a national, though potentially deconcentrated, support network.

The overall goal of the research was to "contribute to the improvements in , water supply services delivery to consumers in small towns in Ghana". Through the fulfilment of the aim and objectives and the clear proposals made, the author believes the insights provided will go a long way to informing and supporting the next generation of policy development in moving small towns water supply towards meeting the needs of all inhabitants.

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APPENDICES

Appendix IA

INTERVIEW GUIDE FOR CONSUMERS

Introduction: I am a PhD student from Cranfield University in the UK investigating into the management of small towns water supply and sanitation in Ghana. I wish to take some of your time get some understanding of the policy direction for water supply and sanitation to the small towns.

Background information on small town

Name of town………………………… Population…………………………

Population growth rate……………….. Number of households…………….

Average household size………………. Key economic activities…………...

Management model…………………… Source of water…………………

Date……………………………………

Socio-economic issues

Q1. Has the community been involved in decision making, construction and maintenance of the water systems?

Q2. Do you make complains about the services of the water supply system? What do you complain about? And how are these complains handled? Overall are you satisfied with the quality of service provided?

Q3. What is your opinion on the quality of water from your taps?

Q4. Are there any civil society groups interested in water issues in your town? Explain.

Q5. Does the service provider make available their performance indicators to consumers and the general public?

Q6. Does the service provider organise public education programmes? How often do they hold open meetings?

Q7. What roles do community chief and elders play in the water provision? Explain

Q8. Do you think there are still many people in the community that need water connection but are not connected?

Operational/technical issues

Q9. What are major types of breakdowns faced by your systems? Explain.

Q10. How long does it take to fix any fault? Explain.

Q11. How many times in a year do you experience breakdowns?

Q12. How is your water consumption measured?

Q13. How many hours a day do water flow? State in terms of dry and rainy season.

Q14. Do you often see water leakages in the supply system? Who do you report problems of leakage to? How are the leakage problems handled by those in charge?

Financial issues

Q15. How much is paid for new connection?

Q16. How much do you pay for water per volume or per month?

Q17. Do you have access to the statement of accounts of the water supply system?

Q18. How are you billed and how are the bills distributed?

Q19. Do you pay your bills often and easily? What do you think the service provider can do to improve payment of bills by customers?

Q20. Do you thinks the bills send to you reflect the quantity of water you have consumed?

Environmental issues

Q21. Are there any laws or bye-laws to protect the water sources? Explain.

Q22. Do they organise inspection of the catchment (surface water sources)? Explain.

Q23. Is water available in the reservoir/dam that supplies the treatment plant through the seasons? Rainy and dry season.

Q24. Are there any taboos which hinder water development for domestic use or for protection?

Q25. Do you have any conflicts over water ownership in your town?

Health and sanitation

Q26. Do you have any public education on environmental pollution in your town? Explain.

Q27. Are there any local means available to minimise environmental degradation?

Q28. Do you often have health incidents like guinea worm, diarrhoea, cholera in your home or reported in your town?

Q29. Are there any public places of convenience in your town and how are they managed?

Thank you for the patience and time this information would be used purposely for academic purposes.

Appendix IB

INTERVIEW GUIDE FOR POLICY MAKERS

Introduction: I am a PhD student from Cranfield University in the UK investigating into the management of small towns water supply and sanitation in Ghana. I wish to take some of your time get some understanding of the policy direction for water supply and sanitation to the small towns.

A. Ministry of Water Resources Works and Housing

Q1. Do you have a policy on small towns water supply and sanitation? What are the highlights?

Q2. Do you think the implementation agencies are going according to the dictates of the policy framework? Explain.

Q3. What do you think favour the development of water supply to small towns?

Q4. What are the major challenges of small towns water supply and sanitation?

B. Ministry of Local Government, Rural Development and Environment

Q5. How has it been for your ministry to monitor sanitation issues separately in small towns since water supply issues are the responsibilities of another ministry?

Q6. What roles have been assigned small towns to protect the environment? Explain in terms of health issues and protection of water sources.

Q7. Do you have policy on household toilets, public places of convenience and general sanitation in small towns?

C. Community Water and Sanitation Agency (CWSA)

Q8 What has been the rate of increase of small towns water supply systems year-on-year bases in Ghana?

Q9. How many small towns water systems are there in Ghana today and how many are operational?

Institutional and legal framework

Q10. Do you have a policy on small towns water supply and sanitation? What are the highlights?

Q11. Do you think the policy framework is pursued? Explain.

Q12. How is small towns water supply and sanitation provision regulated? What is regulated?

Q13. How many people are expected to be served by a single stand pipe?

Q14. Do you have any subsidies for the poor? Explain where they are directed.

Political issues

Q15. Which local government substructures are involved in the small towns water supply and sanitation at the local level?

Q16. Are there any stakeholders whose role conflict with each other? Explain.

Socio-economic issues

Q17. What role do communities play in the construction and maintenance of the water systems?

Q18. Do service providers make available their performance indicators to the consumers and the general public?

Q19. What roles do community chiefs and elders play in the water provision?

Operational/technical issues

Q20. What are major types of breakdowns faced by small towns water systems? Explain in terms of surface and groundwater sources.

Q21. Do you have any institutions that are supposed to be exempted from paying water bills in small towns? Explain

Financial issues

Q22. What is the source of funds for salaries of staff?

Q23. What issues are considered in setting tariffs in small towns water supply?

Q24. Who are supposed to be signatories to the accounts of the water supply systems?

Environmental issues

Q25. Do you have any laws or bye-laws to protect the water sources?

D. <u>Ranking member (Minority Spokesperson) on Water Resources, Works and Housing</u>

Q26. Are the passage of laws and approval of funds on water supply based on political considerations? Explain.

Q27. Do you think the District Assemblies have bye laws on water supply and sanitation? Can you give some examples?

Q28. Does your party have a policy of water supply to small towns? How is it different from the current one being used?

Q29. What do you think are the major challenges in getting water to small towns in Ghana? What is the way forward?

Appendix IC

INTERVIEW GUIDE FOR SERVICE PROVIDERS

Introduction: I am a PhD student from Cranfield University in the UK investigating into the management of small towns water supply and sanitation in Ghana. I wish to take some of your time to get some understanding of the operations of your water supply and sanitation system.

Background information on small town

Name of town………………………… Population…………………………

Population growth rate……………….. Number of households…………….

Average household size………………. Key economic activities…………...

Management model…………………… Source of water……………………

Date……………………………………

A. District Chief Executive, the Desk Officer on water supply and sanitation and a member of the District Water and Sanitation Team (DWST).

Political issues

Q1. Does the District Assembly have bye-laws on water supply and sanitation? Explain.

Q2. What are the roles and responsibilities assigned to the different stakeholders?

Q3. Which local government substructures are involved in the small towns water supply and sanitation at the local level?

Q4. Are there any stakeholders whose roles conflict with each other? Explain.

Q5. How are tariffs set and by who?

Q6. How is the recruitment of staff done and by whom?

Q7. Does the District Assembly have a sub committee on water supply and sanitation? Explain.

Institutional and legal framework

Q8. What performance indicators do you measure your water supply system on?

Q9. Do you have policy on disconnections? Explain.

Q10. Do you have policy on community involvement? Explain.

Q11. Who regulates the operations of the water supply system in your town? What is regulated? Explain.

Q12. Does the water supply operator have a bank account? Yes ☐ No ☐

Q13. If yes who are the signatories?

Q14. How many household connections and public stand pipes do you have? State them separately.

Q15. How many people are expected to be served by a single stand pipe?

Q16. Do you have any subsidies for the poor? Explain where they are directed.

Socio-economic issues

Q17. What role does the community play in the decision making, construction and maintenance of the water systems?

Q18. Do consumers complain about the services of the water supply system? What do they complain about? And how are these complains handled?

Q19. Are there civil society groups interested in water issues in your town? Explain.

Q20. Does the water board make available their performance indicators to the consumers and the general public?

Q21. What roles do community chief and elders play in the water provision? Explain

Organisational culture

Q22. Do you think the staffs of the water supply system feel they are trusted? Explain.

Q23. What incentives are available for the staff of the water system?

Q24. Are the salaries of staff of the water supply system satisfactory?

Q25. Is there a training plan for staff? Explain.

Q26. Are the staffs interested in upgrading themselves? Explain.

Operational/technical issues

Q27. What are the qualifications of the staff on the water supply system? List them.

Q28. What are major types of breakdowns faced by your water systems? Explain.

Q29. How long does it take to fix any fault? Explain.

Q30. How many times in a year do you experience breakdowns and where do the technicians come from to fix it?

Q31. What has been the rate of expansion of the water supply system since its construction?

Q32. Do you have any institutions that are exempted from paying water bills? Explain.

Q33. How often is the water quality tested and who does it? Does the quality meet required standard?

Q34. How many hours a day do water flow? During dry and rainy season.

Financial issues

Q35. What is the source of funds for staff salaries, operation and maintenance and new connections?

Q36. Which issues are considered in setting tariffs? Explain.

Q37. How much is charged or paid for water per volume or per month?

Q38. Are the accounts of the water supply system audited and published?

Q39. How are the bills distributed? What are the difficulties in tariff collections?

Q40. What are the operating expense and operating income per year?

Environmental issues

Q41. Do you have any laws or bye-laws to protect the water sources? Explain.

Q42. Do you organise inspection of the catchment (surface water sources)? Explain.

Q43. Is water available in the reservoir/dam that supplies the treatment plant through the seasons? Rainy and dry season.

Q44. Are there any taboos which hinder water development for domestic use or for protection?

Q45. Do you have any conflicts over water ownership?

Health and sanitation

Q46. Do you organise public education on environmental pollution? Explain.

Q47. Are there any local means available to minimise environmental degradation?

Q48. What water related health incidents are reported in your town? Give figures (e.g. guinea worm and infant morbidity).

Q49. What is the District Assemblies' policy on household toilets and public places of convenience?

Q50. If there are public places of convenience how are they managed?

B. <u>Water and Sanitation Development Board and System Managers/Operators</u>

Political issues

Q1. What are the roles and responsibilities assigned to the different stakeholders?

Q2. Which local government substructures are involved in the water supply and sanitation?

Q3. Are there any stakeholders whose roles conflict with each other? Explain.

Q4. How are tariffs set and by who?

Q5. How is the recruitment of staff done and by whom?

Institutional and legal framework

Q6. What performance indicators are you measured on?

Q7. Do you have policy on disconnections? Explain.

Q8. Who regulates your operations? What is regulated? Explain.

Q9. Do you operate a bank account? Yes ☐ No ☐

Q10. If yes who are the signatories?

Q11. How many household connections and public stand pipes do you have? State them separately.

Q12. How many people are served by a single stand pipe?

Q13. Do you have any subsidies for the poor? Explain where they are directed.

Socio-economic issues

Q14. What role does the community play in the decision making, construction and maintenance of the water systems?

Q15. Do consumers complain about the services of the water supply system? What do they complain about? And how are these complains handled?

Q16. Are there civil society groups interested in water issues in your town? Explain.

Q17. Do you make available your performance indicators to the consumers and the general public?

Q18 Do you have public education programmes? How often do you hold open meetings?

Q19. What roles do community chief and elders play in the water provision? Explain

Q20. How many people in the community are served with public stand pipes? How many people have household connections? How many people in the community are not connected to the pipe water supply?

Organisational culture

Q21. Do you think you are trusted by your customers and the assembly? Explain.

Q22. What is the mission of the community water supply scheme? Are you satisfied with your job here? Explain.

Q23. Do you have any incentives in doing this work?

Q24. What are your individual salaries – does this include social security and income tax? Are you satisfied with it?

Q25. Is there a training plan for you? Explain.

Q26. Are you interested in upgrading yourselves? Explain.

Q27. Do you discuss the performance indicators and how to improve the service? Explain.

Operational/technical issues

Q28. What are the qualifications of the staff on the water supply system? List them.

Q29. What are major types of breakdowns faced by your systems? Explain.

Q30. How long does it take to fix any fault? Explain.

Q31. How many times in a year do you experience breakdowns and where do the technicians come from to fix it?

Q32. What has been the rate of expansion of the water supply system since its construction?

Q33. Do you have any institutions that are exempted from paying water bills? Explain.

Q34. How do you measure the amount of water used by customers and institutions?

Q35. How often is the water quality tested and who does it? Does the quality meet required standard?

Q36. How many hours a day do water flow? In terms of dry and rainy season.

Q37. Do you have problems with water leakage? How do you estimate it? How much of flow in a day/month/year?

Financial issues

Q38. What is the source of funds for operation and maintenance and new connections? How much is paid for new connection?

Q39. Which issues are considered in setting tariffs? Explain.

Q40. How much is charged or paid for water per volume or per month?

Q41. Are the accounts of the water supply system audited and published?

Q42. How do you bill customers and how are they distributed? What are the difficulties in tariff collections?

Q43. What are the operating expense and operating income per year?

Q44. How much of the bills sent out are outstanding or unpaid and how much payment do you receive daily?

Environmental issues

Q45. Do you have any laws or bye-laws to protect the water sources? Explain.

Q46. Do you organise inspection of the catchment (surface water sources)? Explain.

Q47. Is water available in the reservoir/dam that supplies the treatment plant through the seasons? Rainy and dry season.

Q48. Are there any taboos which hinder water development for domestic use or for protection?

Q49. Do you have any conflicts over water ownership?

Health and sanitation

Q50. Do you have any public education on environmental pollution in your town? Explain.

Q51. Are there any local means available to minimise environmental degradation?

Q52. What water related health incidents are reported in your town? Give figures (e.g. guinea worm and infant morbidity).

Q53. Are there any public places of convenience in your town and how are they managed?

Appendix II

Samples of transcribed interviews

1. NATIONAL LEVEL INTERVIEWS

1. Director (Mr. Demedeme Naalenason) of Environmental Sanitation, Ministry of Local Government, Rural Development and Environment – 29/05/007.

Q5. The ministry has the mandate as far as sanitation is concern. Sanitation policy is derived from here and we have had a policy developed since 1999 but were trying to revise it and all consultations with stakeholders have been done already. The other key players we have include the ministry of water resources works and housing who deliver sanitation through CWSA which makes sure that the water they provide is minimally contaminated. They provide alongside water, household and institutional (schools, health facilities) latrines.

There are NGOs (Plan Ghana, UNICEF) who are also into sanitation basically providing household and institutional latrines and some pass it through CWSA. Because of our governance structure all these are done through the district assembly and this is where our ministry should have a key role in monitoring unfortunately that is not done. Apart from the sanitation facilities provided by the NGOs through CWSA the ministry also provides sanitation facilities (household latrines, public latrines, schools, health centres, lorry parks) through District Assemblies in big towns and small towns under some specific projects

We don't limit sanitation to only latrine we also include solid waste which more challenging to the ministry because it is visible unlike liquid waste which usually dries up or washed away by rain.

Though our ministry is the supervising ministry and the policy makers for sanitation due do institutional weakness does not monitor what goes on. The donors, NGOs etc who provide sanitation facilities do their own monitoring.

15% of common fund for each assembly is set aside for sanitation every year or quarter year. HIPC funds are also provided for sanitation at the district level. Special projects like the urban sanitation project provide latrines, solid waste collection facilities.

Monitoring and evaluation generally is a problem in the ministry because it has not been developed properly.

Q6. We have not put in any measures to protect our water bodies as part of our sanitation programme and I am sure in order to look at the environment in a holistic manner that is why the functions of Ministry of Environment has now been added to local government and rural development. Even at the district assembly level, sanitation is about latrines and waste collection and what happens to the water bodies is not catered for. We are looking subcommittee of the assemblies on Environment which have concern only on sanitation (latrines and waste collection) to refocus and include environmental protection. The assemblies act on the issues of environment when they are specific complaints.

Q7. The draft policy document for 2007 has been provided to me but yet to take the 1999 one. But the highlights are;

1. Capacity building is important to the ministry because we are overwhelmed by the problems confronting us now on sanitation and this is attributes to the low capacity of staff.

2. Sustainable financing and cost recovery. How do we recover cost or recover useful products from the waste.

3. Levels of service.

4. Legislative and legal framework

5. Research and development

We have been saying that sanitation is about technology. We have moved a long way to today. Those technologies we have now are they ideal? Do we need to research further because our lifestyles have changed? Some think that the range of technology that we have are not sufficient and that is why people cannot afford.

Challenges

1. Ignorance; people do not want to know of the effects of poor sanitation on their health. Our socio-economic condition is also a factor.

2. Limited technological options; for example in our villages what the people know is public latrines and KVIPs but there are cheaper and user friendly and are available. And because the technologies that we provide are expensive, we have to provide some subsidies through the donors. Because these facilities are expensive to the rural

folks and there is so much land available for "free range" household latrines are not options.

Currently UNICEF is helping us to study some countries (Ethiopia, Bangladesh and South Africa) where progress has been made and some staff have been sent to Ethiopia. What we want to do is to develop a sanitation ladder so that we do not limit the options available. We need to start from the very basic say the use of hoe or cutlass then develop upwards instead of the midway we start from which leaves out a large number of people. It cost nothing for somebody in the village to use a hole or cutlass to dig a hole and free himself and cover it afterwards instead of doing it on the surface.

2. **Ranking member (opposition spokesperson-Honourable Alhaji Amadu Seidu) on Water Resources, Works and Housing – 2/06/07**

Q26. The passage of laws or approval of funds for water supply is not based on political considerations. There are some issues that have universal appeal and you don't need to be in this party or the other to have access or benefit from the project and water is obviously one of such. It is often said that water is life and every government recognises that fact and because it is life no government will intentionally neglect a community or a group of people for political expediency. The Ghana Water and Sewerage Corporation established by Act 310 of 1953 was given the responsibility to provide water for the entire Ghana and at that time had a drilling department that was handled by PWD and there was no clear cut definition between urban and rural communities though at that time emphasis were on urban supply more than rural supply. Over time policies developed and the one that come into mind is the one developed by the NDC which created the CWSA which is primarily responsible for providing water to the rural communities and small towns where the systems are not complex in nature technically, and simple to manage at least cost. The policy is there to guide every government and it has been an ongoing project because we had funding from our donor partners supporting with resources to meet the water and sanitation needs of our communities and when issues of this nature come to the floor of parliament they are discussed dispassionately and where disagreements come is when discussion on whether particular community should be given one or two boreholes or a particular type of system there is always no discussions based on partisan considerations.

Follow up on influence of donors on policies during the previous regime; Usually policies and programmes are jointly agreed upon by both government of Ghana and the donor community most often before a policy is taken on board by government there would have been broad consultation amongst all stakeholders including our donor partners. Records would show that the many consultations that took place before the CWSA programme came on board from Kokrobite, Akosombo, and Elmina with our major partners like DANIDA, AFD, KfW, EU etc. including our NGOs working in the water sector. Workshops are also organised for stakeholders and the input passed on to government for the policy formulation.

Q27. The local Government law act 462 requires that the district assemblies have an engineering department where all the technical experts within the district assembly will be put together in order to ensure availability of supply of portable water and sanitation services to communities. And you cannot provide water supply and sanitation services without putting in bye laws. Infact one of the things that has been done and I can remember is the putting together of the WATSAN committees who are to provide bye laws based upon the guidelines given at the national level by the CWSA. Bye laws are there such as those against pollution, against recasitrant people who refuse to pay contribution towards the capital cost, on tariffs based on how much pay for a bucket of water taking into considerations the poverty levels in the communities. There are bye laws on sanitation as to waste disposal.

Q28. Yes the party has a policy on water supply and sanitation to small towns. Unfortunately for the party the CWSA was its brain child which arises from the manifesto we provided to the good people of Ghana and I believe that every serious political party in Ghana has policy in water supply and sanitation because parties are voted for based on their manifestos and if a party wants to govern and govern well it must just have policy on a basic issue like water supply and sanitation.

The NPP government is just improving upon what the NDC did and there have not been any change in policy direction.

Q29. 1. Availability of water sources to be developed. In most areas underground water is still difficult to get.

3. Cost of systems. The 5% capital cost is very high for most communities and to get contribution from individual households of the communities is difficult.

4. Power supply is another challenge to small towns water supply and sanitation because the cost of power keeps increasing in Ghana and in order to break even as a result of increased operational cost tariffs must be increased.

5. Spare parts for pump. Sometimes when the system breaks down it take a long time before it is solved.

The way forward is for the donor communities to scrap the 5% investment cost though the original intention of donor to use that to get the communities to see the project as their own is good, because people do not see that government is their district assemblies or the their WATSAN committees. The 5% is still a huge burden to the communities.

3. **Director in charge of Small Towns – CWSA Headquarters Miss Charlotte Engmann – 4/06/07**

Q8/Q9. The rate of increase of the small towns water supply is not even year-on-year because any new project depends on the donor funds available in a particular year. The figure you quoted of the 287 could be right. We have between last year and this year a total of 50 either completed or on going.

Q10. I would not refer to that as policy issues but strategies and these are;

1. The fact of paying the operational cost i.e. the community should pay enough to cover the operational cost.

2. Role of the private sector in providing maintenance services and general operations.

3. Sanitation and hygiene promotion

4. Tariff setting

5. Water quality

6. The role of the district assembly

7. The legality of the WSDB

Q11. We have the small towns guidelines and there is overall water policy which is yet to be approved by cabinet. If it is approved it becomes easier to get the guidelines from it. As at now the district assemblies do not play their roles as expected and it is just because they do not have information and we have recently tasked our Regional

Offices to reach out to all stakeholders so that they will get to know about what they need to do.

Q12. The CWSA plays a facilitating role and does not regulate operations of small towns. When it comes to the issues of tariffs it is the DA that should approve them. The DA in effect regulates the small towns and CWSA comes as a back up to things that are beyond the assemblies.

Q13. 300 people are expected to be served by one stand post and when they are double as you find in the small towns is suppose to serve 600 people and the maximum travelling distance to a stand post is 500m. However the stand post locations mostly depend on what the community tells us but it should technically feasible.

Q14. We usually allow the communities to find a way of taking care of the destitute we don't call them poor because most of our communities are poor. We usually allow them because what is good for one community might not be good for another we tell them that they must find a way of taking care of those who cannot pay. We have not institutionalised any subsidies provision because we don't want to put down any rigid arrangement.

Q15. We usually connect some key officials of the DA like the district planning officer, finance officer into the DWST. You know as at the time the programme started there was nothing like the district engineer, the works department that their now talking about so we thought we should put up something quickly to bridge that gap. We have now asked the water boards to involve the unit committees because the initial water boards that were formed were without these people. We expect that the next selection will include them and these are some of the things that the new water board bye laws seek to address.

Q16. There are no conflicting roles and with the new water board bye laws the roles are clearly specified. Some assembly members think that they should have some kind of key role in the board but they have been involved in some cases on observer status but in some cases as members. But they want to go beyond that to have the majority voice but we tell them it cannot be possible because they are suppose to have the oversight role and if they get deeply involved in the day to day running of the system and there is a problem they will be part of the problem but now they can be members something that used not to be.

Q17. During construction the community is expected to watch what is going on and if something is not going right in their opinion, they need to alert the water board which would intend inform the district assembly. Sometimes what they say is technically not correct for example sometimes they say that the pipes being used are small though that is the required standard, but in some cases they are useful. During operations they have to approve the tariffs before they are taking to the DA and they have to play their part again by paying their part of the tariff and twice a year they should comment on the report submitted. They also have to pay the community contribution of 5%.

Q18. Performance indicators are not made available to consumers by service providers and I think it is something we should encouraged but the question is whether they will understand and measure. But when you tell them they can measure some indicators like down time and colour of the water. This time we rely on the water board to monitor the performance.

Q19. We did not want to assign the community chiefs any roles and where they have been they cause confusion but some have been helpful. What we say this time is that the representative of the chief should be a member of the water board and not the chief himself because he has a role as the father of the community.

Q20. There are two major problems; 1. Electricity fluctuation which does not allow the pumps to function properly so for the new design guidelines we have incorporated two different protections against that. So when the power fluctuations the circuit breaks and you cannot pump though the pump is functioning well. 2. When a part the pump gets damaged. 3. Water quality problem. Sometimes when a borehole is being drilled the water is tested to be good but after days/months of use you realise higher concentrations of iron and you have to look for iron or manganese removal which involves extra cost the project might have been handed over. For surface water when it is treated well it has no problem especially when it is slow sand filtration. The problem is when is conventional like that of Salaga. We recommend that when it is a conventional system we need a private operator for it

Q21. There are no institutions that are exempted from paying tariffs at the small towns but the major problem is how to get some institutions like the police schools hospitals to pay. For sometime now payment of water bills for these institutions have been centralised and the payments is done from the ministry of finance which is ok for organisations like Telecom, GWCL who have head offices in Accra but not for small towns because water boards have no head office so all the water boards bring the bills for these state institutions are brought to CWSA who intends present them to finance before one cheque is signed for CWSA to now present individual payments to the various water boards which takes a long time.

Q22. Staff salaries are expected to come tariffs. Apart from the staff we expect that the water board will pay their allowances also from the tariffs. What we have realised is that the older water boards do not pay allowances to members but every work deserves payment. The older projects like the CIDA were not paying the water boards due low tariff we think that they did not understand the issue of tariff setting properly. But the new projects like the IDA, EU, GTZ, new DANIDA.

Q23. The consultants on the projects take the water boards through the tariff setting in order to recover the full cost of operation but the initial tariff setting they do not go through any process again they just increase the tariff based on prevailing market and social conditions which is not scientific. So we have recently sent out our tariff setting guidelines to all the regional offices make it available to the water boards to follow if not in future they will set very high tariffs that can cause problems within the community.

Q24. The water boards have bank accounts usually two. One current accounts used for the day to day operations which has the members of the water board as the signatories. They also have a replacement accounts or a savings account which most has the district assembly as signatory but in some towns the water board controls that too which is wrong.

Q25. Though sanitary survey has been captured in the policy guidelines we have not started training members of the water boards in sanitary survey. We have no bye laws to protect the water sources.

Challenges

- Legality of WSDB
- Sanitation
- Water quality
- Institution bills
- Private sector involvement

The way forward

- To operationalise the guidelines
- To provide proper training to the water boards, DA and the Regional Officers of CWSA
- To go back to old projects and assess what they need to function properly.

4. **Director of Water, Ministry of Water Resources, Works and Housing – Mr Aboagye Mintah 5/06/07**

Q1. One major highlights of the policy on small towns is the demand driven approach intends to make communities feel the own the project. Unlike previously where the government just carry projects to them and the communities misuse such projects. We do not have policy on regulation but the ministry is in the process of preparing bye-laws and we think that will to ensure quality service. The WATSAN committees at the communities have been set up to represent the people so they are taking through some training to enable them perform their functions like checking of valves, setting of tariffs from knowing what it takes to maintain the system. The tariffs are charged mostly per bucket and the community determines who cannot pay for the water and so are exempted.

The water directorate has just been established (barely a year ago) in the ministry and so we are setting up mechanisms to monitor operations of small towns water supply but in the mean CWSA plays the role of monitoring.

Q4. Finance is a major challenge in getting water to small towns to meet the MDGs since the population without water in Ghana is still huge. 58% of rural Ghana which include small towns have access to water. Another challenge is inability of the district assemblies to form the district works department which is suppose to be the department to take care of infrastructure in the assembly and the members will be technical men. The problem now is the DWST is made of people from different departments who usually go on transfers and so the DWST membership is never permanent but the works department would have had permanent staff and the link

between DWST, WDSB and the assembly would have been strong and monitoring would have been better.
We expect the assemblies to take a greater charge of the water issues. We always have problems of the electing members to the water boards because of local politics.

5. **Team Leader (Dr Chris Brown), District Capacity Building Project (DISCAP), Bolgatanga – 21/06/07**

DISCAP which is district capacity building is to build the capacity of district assemblies to deliver water supply better. DISCAP is seven years and when it started all the focus was on the district assemblies (DWST, the planning unit etc.) but what we realised within a short time was that it is good but not enough because the district assemblies themselves do not provide water. They only support the water board which provides water and so what we were doing was too indirect so we have to develop interventions to support the water board.
What we have developed over the last 4 – 5 years now is what we call optimisation model which is a software intervention and not for hardware to support post construction management of small towns within nine towns in the upper east, upper west and northern regions. These towns are Zabzugu, Bimbila and Wulensi in Northern Region, Sandema, Chiana and Chuchulga in Upper East and Jirapa, Lawra and Nadowli in Upper West Region. We did a lot of training, a lot of different activities with the water boards. What we did for the water boards on the optimisation model is hands on, onsite capacity building and training but we also realised as part of that process that you really need to think about water supply in an integrated fashion. It is something you cannot do at a training perspective to have a two/three day workshop but need something more detailed and complicated than that. So we did was to work with some existing training institutions within Northern Ghana to help them develop courses which the can be offered in future on fee paying basis to district assemblies, to water boards which provides that complex, detailed, thorough, proper, longer and formal institutional training for 4 – 8 weeks. We developed actual four different courses; Area mechanic training at Nandom Vocational School, another one targeted at District Health Management team at School of Hygiene in Tamale on sanitation training, another one targeted accounts people on the water board at the Bolgatanga polytechnic on financial management and the one at the Tamale polytechnic which targeted at system operators and managers. It is our hope even

when DISCAP is over the training will still be active inn those institutions for the target groups.

If want to think about what is needed to manage water system properly you have think about the entire system, the entire institutional network within which the water board operates. You have to look at a wide range of different issues one of which is the basic competence of the staff but it cannot be the only issues. You need the water to distribute, you need DA support, you need CWSA to provide the technical support, you need good community relation in terms of people in the community understanding the water boards' operations, you need financial viability etc. If you look at the different parts and try to address them you can see a measurable improvement in the management of the systems.

The optimisation model is just training and capacity building. What DISCAP is saying is, people in the water sector need to re-orientate their thinking because the sector is dominated by engineers and they look at the sector technical point of view, systematically they see problems as a broken pump, a problem is broken overhead tank or a problem is there is not enough capacity to pump water or what ever so they come with technical solution. They become puzzled that after they build a new system or rehabilitate a system to operate at a certain design capacity when they go back a year later the system operates at about 10% that design capacity. The real problem is that they have not done the job they only do pump, pipe, tank etc. and walk away. Part of the support need to be at the management side which is harder. The technical side is easier because any proper engineer can figure out any problem but the management side you deal with people and you have to talk to them, work with them their babies die, they get transferred. So what DISCAP is arguing is that the water sector in Ghana there should be more emphasis on what we call the software side that management. It is not enough just to go building and re-habilitating systems and thinking you have done our job. You have done half the job. We are not saying is a bad thing we need to build and manage. People say they understand but in terms of how they allocate resources, personnel, money, policy attention they don't pay much attention to the management side. The leadership of CWSA are all Engineers.

If you look at the law CWSA and the MWRWH have the statutory responsibility to facilitate water supply provision at the local level and that means they should not be themselves be building and managing systems. They should be providing all the technical, policy and management advice that will help the system run properly so what we have done is to get them convinced about what the optimisation model is all about so they can support and provide their time. What I have realised from the CWSA in the three Northern Regions is that they are busy people and what they spend their time on is hardware. Building new systems and rehabilitating existing ones. They are very aware that is not enough and they want to know what to do on the software side so they receptive to some of these ideas. I hope CWSA will years to come increasingly bring that to their work. CSWA and the DA between them are the two institutions to support the water boards to do their work.

Major Challenges of small towns

When we started they were no management interventions, systems were operating between 10 -30% design capacity, water rationing, pumping 3-4 hours a day, extended period of breakdowns, revenue flows were very weak, water board may not exist or may not know what is going on. So what we are saying is these things are symptoms of management system that is broken. We need to attack all those management issues. You need to think about revenue issues. E.g People don't pay their tariffs if they do not receive water. So you have to fix the system enough to be getting the water. And if you want to be getting water, then you have to work hard for people to be paying their tariffs and what DISCAP has done is getting Government to pay their tariff. In the North the most indebted customer is Government (police, schools, hospitals, DAs) up to 50% of the revenue of the many water boards come from government institutions. And how is the water board supposed to operate without revenue? So you have to make sure that the water bills can be there and you have to be very hard on the finance side and setting tariffs at the appropriate level. Water boards charge tariffs at inappropriate level and they have poor people subsidising the rich people. Typically the tariff at standpipe per litre is more than the tariff at private connection who are relatively rich. Why should the poor pay more and have less good access because they have walk a distance and carry the water. So you have to work the tariffs appropriately. The financial management side is very important. Technical management side not all the operators know what they are doing sometimes he is the son of the chief or whatever and there is a huge turnover of staff and you need to continue to provide technical training. In the southern part of Ghana the towns are larger and they make more money from tariffs to manage their systems better.

6. **DISCAP Mentors – Hamza Zakari, Bimbila system manager and mentor for northern region cluster, Moses Awakawe, DWST member Sandema water system and mentor for upper east cluster, Gaety Ndebuo, Jirapa system manager and mentor for upper west cluster. 4/07/07**

The major aim of the mentoring system is to bring up all optimised towns to an appreciable level of performance in the areas of financial, technical, administrative, community mobilisation etc. and sharing our experiences and knowledge with infant boards. The mentors are considered in their regions as those that have their systems operating above the others and possess some skills that should be shared with other boards especially the infant ones. Each mentor though is supposed to help the three clustered towns which are under pilot help other small towns outside when their services are needed. E.g Hamza Zakari has visited Buipe, Salaga, Daboya and Bole to attend to some specific problems. They were selected from interviews conducted and monitoring of the performance of all managers.

There are 9 optimised towns in the three Northern Regions; NR cluster: Bimbila, Wulensi and Zabzugu. UER cluster: Sandema, Chuchuliga and Chiana. UWR cluster: Jirapa, Lawra and Nandom.

DISCAP in setting up these three clusters organises meetings with us where we share ideas and educate our DWSTs on their roles and responsibilities especially where new members have been brought on board and how to monitor the water boards.

DISCAP in coming up with the idea of mentoring realised that in carrying out their functions some water systems breakdown due to some basic technical problems that do not need an external mechanic. But the technicians are not capable of solving such basic jobs like mending pipe burst, changing of blown up fuse, installation of meters and many more. Due to the proximity of these optimised towns, we are as mentors able to train the other managers and operators to carry these out.

The training programmes organised by DISCAP for all water boards in the three northern regions were put in models such as water quality, staff efficiency, roles and responsibility of all stakeholders (before water board chairmen used to collect money from consumers) etc. to cover all thematic areas. Troubleshooting and channelling issues to the DA in the proper manner were all acquired.

Under this optimisation model, communities now understand the roles they have to play in the water business so day in day out consumers walk into our offices and demand to know about our operations. This used not to happen because people saw the water board as another GWSC where the state pays staff to work in the water corporation without any relationship with the consumers. The attitudes of our consumers have changed considerably.

The challenges confronting the WSDB in the three Northern Regions include;

1. Lack of adequate education for all stakeholders as to their roles and responsibility to deliver adequate water supply.
2. Setting tariffs at least to take care of "our hand to mouth" requirement.
3. Getting all stakeholders to continuously come together to share ideas on the way of achieving better performance.
4. All small towns water systems in our operational areas are not able to supply adequate water supply to the consumers due to population growth, equipment breakdowns, inadequate financial base.
5. Monitoring of operations by DWST

The consumers keep telling us that they will be willing to pay more for water on condition that they get regular supplies. "We are not happy with the way the water flows, that is why we are not always ready to pay for even what we consume".

In order to achieve sustainable water supply and sanitation in small towns;

1. Proper training of WSDB to perform their duties properly.
2. Performance targets should be set for managers and WSDB and to pay staff well.
3. Adequate measures should be put in place to make people pay their bills timely.
4. Good tariffs should be set to generate more resources into the system.
5. DA should be obligated to audit WSDB accounts regularly.
6. All WSDB should be compelled to set up their replacement accounts and make regular payments into it.

7. All WSDB should regularly update their asset register for proper planning.

8. Since politicians cannot be left out of the water business so when we calculate our tariffs and the DCEs or MPs think that is high for the people instead of asking for reduction they should support the system with the difference.

We believe that if all the three northern regions are clustered and independent operators made to do what the mentors are doing would help the systems. In that case small towns water supply and sanitation operations could be co-ordinated properly and we can be meeting regularly as a region to compare our activities and to learn from each other.

7. ISODEC (Dr Steve Manteaw)

ISODEC is the founding organisation of the National Coalition Against Water Privatisation formed between 2001 – 2002.

ISODEC's interest against water privatisation was born out of its long interest in the water sector. ISODEC has been in rural water since 1984 drilling boreholes and after sometime we had evaluate the impact of our interventions. The evaluation revealed that in some cases where we provided mechanised boreholes after a while the pumps breakdown and the people have no resources to repair them and they returned to the use of the unwholesome water.

So for the poor if you begin to put a commercial value on water delivery you would inadvertently be cutting them away from water delivery. It happened in Birmingham where the pre-paid meters for water supply were introduced and people were cut so I know, today in the UK it is illegal to disconnect a customer but rather resort to the small claims courts and we have to use the same procedure if somebody owes you. We have to use the courts and if the person cannot pay the court will enter into some kind of arrangement to enable payment by instalments. This is what one thinks of formulating water policies to take care of the poor.

So as an NGO we cannot be doing what government does that is going to a community and finding out they do not have water and you go ahead and provide them with water. We want to find out why they do not have water and the why will lead you into the policy arena so you engage with policy makers in terms of ensuring that resources that are allocated through the budget are done in an equitable manner that ensures social justice. Those who do not have should be prioritised. There are some who have abundance of water and they use some to wash their cars and water their gardens while others do not even have for drinking so in allocating resources you get those who do not have at all to live as human beings and that is the background with which we came.

ISODEC pioneered the first community water and sanitation project in Ghana under the Small Business Unit of the World Bank. The programme was successful but we pulled out because we thought it was wrong and not sustainable in terms of depending solely on donors to finance water supply in rural communities. What about if donor fatigue sets in and they withdraw their funding so happens to the community? Secondly the policy itself was discriminatory in that the communities were supposed to make 5% capital contribution for the provision of the water facility. For places like the Upper East and West, Northern Regions and some parts of the Central Region the 5% capital cost is a huge figure for them so you are indirectly telling them that they cannot have water. Meanwhile those of us living in the bigger cities and are economically better off do not contribute to the capital cost of providing water. Ghana Water Company comes to lay all the big big pipes and connect to our homes and metered and so we pay as we consume. We had to pull out.

Since the year 2000 we knew water privatisation had been on the drawing board for a long time even during the regime of the past government (NDC) and at that time the present government (NPP) in opposition opposed and the reasons they assigned were shared by ISODEC. That if you privatise water you are beginning to treat water as a commercial good but water is a public good. We are beginning to treat water as jeans or shirt. The private person coming in is driven by profit motives and when you do that obviously those who cannot afford will not have access to water and that have implications.

We think that if anything at all when people pay taxes there are some goods which are classified as public e.g. health, education, water etc we cannot commercialise and every citizen must be guarantee these things in the act. If you begin to commercialise these things you are beginning to exclude people and already in Ghana we are not paying people economic salaries.

When NPP took over something they opposed that is the water privatisation, they decided to put the whole programme on a fast track so we thought we should come in immediately, we thought we should do something, we thought the road they were taking was a dangerous one because it exclude our constituents the people we represent, the vulnerable, marginalised and poor in society. So we initiated series of engagements, round table discussions. They did not call it privatisation but urban water reform and if you want to talk about urban water reform it should bother about privatisation. We are looking at a more prudent way of delivering water and not just privatisation. Driven by the neo-liberal agenda of the World Bank they were trying to push privatisation as the only option on the table and this we disagreed and so we held public forums following this round table discussion. We brought stakeholders to the teachers' hall in Accra and at the end of the workshop that followed the public forum we came out with what we called the Accra Declaration which became the genesis of the Coalition Against Water Privatisation which was lead by a staff of ISODEC and we used the coalition to engage with government and the world bank on the issue. This lead to the postponement or delay in the implementation of water privatisation in Ghana and consequently to the revision of the initial plan which was a lease arrangement which would have leased GWCL assets to a foreigner for such a time the contract will set out which amounts to sale because if we talk of sale we do not only mean outright sale. But lease sale is also there but then the government was saying that they are not selling the asset and what we were saying is that they were selling the assets for a given period because during the lease period we are no longer the owners of such assets. And because we were able to galvanise public opinion against the lease arrangement they eventually changed it to a management contract last year (2006) or so. We are still opposed to management contract because we went through the contract documents and we realised is just a change in strategy but they will still want to privatise Ghana Water Company but the prelude is the management contract. The contract says that 5 years into the management contract it should be reversed into a lease contract which we are opposed to. We are also opposed to the management contract itself because management contracts do not work. At least we have not been shown any evidence that it has worked anywhere in the world. Even in our own country Ghana, at the time when Ghana Airways was on a decline the government brought in a team of managers, Speed Wing Ltd from UK lead by one Rex Liza to come and manage Ghana Airways. By the time Speed Wing Ltd was leaving Ghana they had saddled Ghana Airways with more debt in the form of remunerations, allowances and all that and that was the last nail in the coffin of the airways. Again in our own Ghana Telecom when we had some form of partnership with Malaysians and we asked them to manage telecom for us after a period we realised Ghana Telecom became worse off than before the Malaysians took over. The government then decided to take the management from the Malaysians and gave it to Telenor Norway under a management contract. Telenor could not fulfil the terms in the contract in terms of the deliverables so the government of Ghana refused to renew the contract and Telenor has to pack bag and baggage and left. So we have our own experience that confirms that management contracts have not worked for us. And elsewhere in the world we challenged the government and World Bank to show us where management contract has been successful.

Barely one year into this new management contract we are having serious problems with the implementation; It appears Aqua Vitens Rand won the contract on to manage GWCL in Accra and other cities through deceit in the sense that the personnel whose CVs were tendered for the bids are not the same people who have come down and I had the chance of telling this to the managers on Joy FM 2 or 3 months ago (June or July 2007). We challenged them, held press conferences and blew the cover off their top. Cliff Tony, who was their general manager in charge of operations, is not qualified person to be in the water sector because he has no background in the water sector. We hear he was a jazz player somewhere in South Africa. He was sacked from Tanzania under the same management contract for non performance and you bring such a person here. In fact there are a lot of them there who do not have the requisite qualification so we are tempted to believe that they won the contract through deceit. As a result of our agitation the director and his deputy and the general manager have all been sent away this month (September 2007).

From the experience we got from the study of Manfi – Kumasi in the Volta Region and Savelugu in the Northern Region the community participation in the management of water is the best option but we need to really conceptualise it and have a blue print for communities who want to run their own water system. We are even agitating that even in the big towns, the management of the water system should be place at the door step of the DA so that we have a certain community participation in the decisions that affect the water company. At the National level the argument we are also making is that water systems must remain public rather than private and that if we think we need capital injection to expand the networks, lets float shares and so far as we are human beings and will continue to drink water, any investments in water is investment that can never go wrong. We know that the companies in Ghana that float shares are always over subscribe so floating shares in Ghana will always be successful how much so for water that we all depend on. So let float shares and let Ghanaians become shareholders in our water companies. At annual general meetings let all of us go and have our say on how we want water to be managed. We are agitating that government should begin a process of debate and dialogue towards the design of blueprint for delivering of water so far as poor people are concerned. The approach has been ad hoc.

When we campaigned against water privatisation of water in Ghana the responses government gave in terms of protecting the poor is the introduction of block tariffs so that if you consume above some quantum you begin to pay punitive tariffs and we are aware that the poor to not live in self contained houses. They live in compound houses and they rather pay more with that arrangement because of the cumulative consumption with a single meter and so you are killing them.

The difficulty in developing countries like Ghana is how to target the poor. It is really difficult because the poor are in the middle of the rich so if you have a policy that has not really thought through you will really start missing out on your targets.

ISODEC still believe that the whole management and delivery of water should be driven by accessibility and affordability especially with the poor in mind. The discussion on how to manage and deliver our water so that the poor can have access has not yet been done.

The civil society organisations have limit to which they can go in getting experts to monitor water providers. Some of these constraints are financial and access to information. Unlike the developed nations it is not easy to access information in Ghana and this is because the freedom of information act has still not been enacted. All the same we are still doing our best to monitor and I have on my desk water quality test that we carried out on water samples from two different laboratories in Accra in other to find out whether the operators are not trying to cut down operational cost by reducing the amount of chemicals use for water treatment. When we are taking these samples we go with the media to witness all that but it has been expensive to do this kind of monitoring and we do it from to time.

The other thing we have to be doing as a country is to strengthen our regulatory institutions. This is a country where we do not even have a consumer protection agency so consumers are given a raw deal by companies and you do not have anywhere to complain. What we have is regulatory institutions for specific sectors that are very weak institutionally and technically. We need to mobilise consumers into associations.

We had a meeting with the World Bank director in charge of water and sanitation (Peter Mac Phil) who admitted that the failure to push through the original plan of water privatisation in Ghana was a public relation failure. That the water resources secretariat the World Bank set up was ineffective in countering a small organisation like ISODEC and that has lead to the failure and so all the people that worked on the communication sector of the secretariat were removed. The communication outfit was handled by one Captain Victor Ansah a retired public relation officer (PRO) of GWCL and one Kwamena London a retired public relation officer (PRO) of ECG and when they were removed the World Bank Country Director himself took charge of the public relation at the water resources secretariat until recently they got another man one Emmanuel Eshon. The strategy the secretariat is adopting is that they should not appear with us on any platform so you let any radio station call for water policy discussion and when they get to know that ISODEC has been invited they will not appear.

ISODEC does not propose alternative policies but what we think must go into any policy we submit the proposals and papers as and when it is necessary. We had one time gone as far as to the Council of State with a whole petition on things that are wrong with the current arrangements in the management contract. To be sure of the proposals we are making we invited independent people to come and talk to the people, talk to us and talk to government to see whether the arguments we are making are not firm. We do policy engagements and codify policies and make suggestions as to the way forward.

We know for sure that Aqua Vitens Rand will fail and already there failures in the performance and the information we have is that with the issues we raised in our meeting we held with government they have slapped a penalty of about $30,000 for their inability to stabilise the pressure in the system, reduced unaccounted for water and some other core things I cannot remember that they failed on. With this failures adding to the unqualified staff they are using we are piling up all these and strategising because the government and the World Bank on their own will not take any action.

We cannot trust Aqua Vitens Rand.

We think that even if we want ideas from foreign water companies into our water delivery we should enter into partnership arrangements which come with the added advantage of passing on experience to local people because they will work hand in hand and they will transfer know how and experience. But the current arrangement where we are sitting somewhere and they are managing things is not good. Our ultimate will be community involvement in the management of water. If we want to have public private partnership the private must be indigenous Ghanaian private sector. The question is how do we build the capacity of the indigenous private sector to be able to play its role in the management of water delivery. If we design the partnership arrangement for the contract we could put in a condition during the bidding that any foreign company interested must do that in partnership with a Ghanaian company. So that with time we can phase out the foreign companies and let the local companies to take over.

LOCAL LEVEL INTERVIEWS

SALAGA

1. **Water and Sanitation Development Board (WSDB), Manager and operator.**

We usual get our resources from the District Assembly and the WSDB hires contractors to execute works on the water system in times of problems.
During the rainy season customers do not pay bills because they claim they do not use the water since they have hand dug wells in their homes.
The WSDB does not handle sanitation but rather the DWST.
We ever had problems amongst us when the former system manager did not want to release the only motor cycle to be used by the operator on duty to go to the headworks and also we received information that he has been taking money from some section and opening water for them even when it is not their time to receive water so he finally resigned.
We issue flat rate water tariff and it is not based on any calculations. “When we were being trained in budgeting and tariff setting in the KNUST in Kumasi I (accountant)

told the facilitator that this not training we from Salaga because in Salaga we do not use meters". We usually cannot increase the tariffs because the ruling party executives always get the District chief executive to believe that it reduce their popularity.
Recruitment of staff is done by the WSDB but there has been a time when the DCE sacked three of our staff for political reasons.
The only way we measure our performance is how people in town comment our work.
We disconnect customers who do not pay bills for two openings and have received verbal warning.
We have one bank account with chairman, secretary and treasurer of the WSDB as signatories.
We do not have any fixed number of people being served by a standpost since people cross from one area to another for water.
We have 16 standpost which are not working due to low pressure and 476 household connections.
There is no subsidy for any body and except the fire service all institutions are suppose to pay bills.
No meetings are organised with the customers but we receive complaints about irregular flow of water due to power rationing and also about low pressure.
There is only one civil society organisation (Bomunimakuse) which has been contracted to educate people on water conservation.
The water supply in town is so serious that the manager has not had water flowing to his house since the past three years. But we feel trusted by the DA and customers. We have no idea of a mission for the water system.
All our seven staffs take only 10 new Ghana cedis a month each. We do not pay social security or income tax.
The water system does not have any training plan for staff when donors and some organisation organise training for water system operators we attend. Only the accountant has attended one among the current staff. The others who have attended some training have resigned from the work for better jobs.
We always meet as WSDB and operators to discuss the problems of the water system and how to improve our performance.
We need to mention that we do not have an office and so our documents are scattered. Some are with the Chairman, others with the secretary and the accountant.

Qualifications of staff range from the highest at GCE 'O' level (accountant) through to Intermediate technician (operator) to Middle School Leaving certificate. When the project started GAP only selected people of interest and not based on qualifications. The water board is also selected based on interest to do voluntary work and sectional representations and not on qualification.

The major breakdowns we have are problems with electric panels, intake motors, pipe burst, leaking high lift tank which can no longer be used so we pump water directly from the headworks to pipes in town. This is the cause of the low pressure being experienced in town. Due to availability of funds from the DA it takes us one month mostly to fix problems. The high lift tank has been idle due to the leakage for more than a year now. We experience major breakdowns between 4 – 5 times a year. Technician from GWCL in Tamale come to fix our problems for us. They also test our water quality every six months and have commending us of producing good quality water.

We do not meter our consumers and we supply water 8 hours to three blocks a day but during rainy season we supply for just two hours.

We have no idea of our unaccounted for water.

New connection charge is 50 new Ghana cedis without materials and labour and this goes to the water board.

Every house with a pipe in a section pays 50 new Ghana pesewas for each day water is supplied to the section.

Our revenue from the water sales is bad especially in the rainy season when we receive virtually nothing but in the dry season we receive between 600 – 800 new Ghana cedis a month.

There is a woman who claims the river from which we pump water is their family god and takes up to 100 new Ghana cedis a year to pacify the gods. She has just moved the town and has putting pressure for free water connection to her house.

Water is always available in the river throughout the year.

Our major challenge now is the replacement of the leaking high lift tank, repair of our low lift pump, replacement of our motors and our salaries.

2. **Customers 1**

We receive water once a week and we pay 50 new Ghana pesewas per house anytime pipes are opened within the week and the water flows just foe one hour because of low pressure.

Sometimes the water is not clean and we have filter before we can use.

We do not know of any civil society organisation in this town.

Majority of the people in this town still do not have access to the pipe water.

Breakdown of the water system sometimes take up to one month and this happens about three to four times a year

No meetings are organised by the water board with the community to discuss issues of the water system.

We do not have a standpost in this area and people go to buy water from houses where there are pipes at between 10 new Ghana pesewas and 20 new Ghana pesewas for 36 litre container. We know the water board might be making loses on their operations but we are happy with the 50 pesewas per pipe in a week.

No body comes to discuss sanitation issues with us. We need a rubbish container in our section but have not been given one and we cannot carry our rubbish to the far place where there is a container so we throw them away behind our homes.

The toilet in our area is not cleaned but we still pay 30 pesewas for each entering of a person.

3. **Customers 2**

No meetings are organised with the community by the water board to discuss anything but there was an occasion when announcement was made when there was a breakdown.

We complain always to the water board. We do not get water through our pipes because of low pressure so we have make some dug outs ("down below") to the pipeline and cement before we can collect water.

Water quality is good.

We are not aware of any civil society organisation interested in water issues in the town.

The only time we heard a chief from this town talking about water was when he asked water board to come and remove the standpost in front of his house because water does not flow through it.

Majority of people in the town are without pipe water.

The major breakdown we have is at the pumping station and it takes more than three weeks before it is repaired. The breakdown happens about four times a year.
We get know water bills but anytime the taps flow each house pays 50 pesewas irrespective of the quantity of water fetched and it is good for us but we will pay more if it was flowing regularly.
The water flows for just two hours a week.
New connection is 50 new Ghana cedis.
Water is available in the river all year long.
We pay 30 pesewas person per each entering into the public toilet by the person who cleans the toilet.

4. **Customers 3**

No meetings are organised by the water board with the customers and no information is passed on to us except those who go to enquire.
Complaints about the service are channelled through unit committee members and assemblymen to contact operators.
We are supposed to be getting four hours of water flow a week but we mostly do not get up 2hours. Sometimes when we complain about the hours of flow and the operators accept that they do not come for their money.
Each of our sections are divided into blocks and because customers are not aware of this and the irregular flow hours, anytime a block is receiving water the others rush there to fetch creating problems for us.
No civil society group exist in this town but during the construction of the system in 1999, when some youth noticed that the main pipelines were replaced with smaller ones they demonstrated in town but the military were called in to beat them up because the political leaders then said that was the work of the opposition party.
Because the hours of flow of water are unpredictable after people fill their containers they connect hose into their unlined wells in their houses.
A large proportion of the people in this town do not have access to the pipe water.
The major breakdowns are mostly electrical problems and it takes one month for faults to be fixed.
The three driest months are mostly the water crisis time in this town since all our wells would have been dried up.

We pay 50 pesewas per house anytime the taps flow irrespective of the hours of flow or the number of people in the house.
We have heard that some areas have started bribing operators to open their taps even if it is not their turn.
We would be ready to pay higher tariffs if water starts flowing regularly.
We pay 50 new Ghana cedis for new connection.
Water is always available in the river throughout the year.
The major problem facing our system is the high lift tank which is leaking badly so water is pumped directly to the town exerting too much pressure on the pumps which get spoilt.
Sanitary inspectors visit our homes and talk about the need to keep our environment clean.
We pay 30 pesewas for entering into the public toilet which is not even cleaned. We usually contribute to rehabilitate it and the DA does not reimburse us.

DAMONGO

1. **DWST**

The Damongo water system was rehabilitated under GAP project in 1997 and because the GWCL was managing it they did not form WSDB for the towns but we had DWST to cater for the rural areas.
The system worked for only 5 years and stated facing water shortage in the dam by 2002. The catchment was being encroached by farmers and the use of fertilisers also contributed to silting the dam.
The Engineers and Consultants knew we were going to have problems because we were told that by 2000 we will face water shortage in the reservoir.
When they came to survey for sources of water before the rehabilitation two sources were identified, this current dam and Kpiri but one section of the town people said that river is their god and it does not like noise on Fridays and so people do not go

there on Fridays. That if they allow for the water to be developed surely they will install pumping machines there and workers will be going there on Fridays to work and so they will not agree. It resulted into head arguments and because the Engineers wanted a closer source in order to minimise the cost they went for this reservoir which has finally dry up.

The current water supply scheme is an emergency one which came about when one of four of our already existing boreholes was mechanised by an NGO called New Energy and at the beginning of the problems it was helping us. These boreholes were drilled in 1998 as standby for the town by GAP.

EU was in the northern region to help in rural water systems and our district, the West Gonja District Assembly happens to be one of the beneficiaries so we made a case that they cannot only serve the rural communities alone since the district capital does not also have water.

Initially they did not want to help because of the presence of GWCL and so opted to provide Damongo with point sources to avoid conflict with the GWCL pipelines. They drilled 10 boreholes out of which 5 were successful and this was in 2005.

We took advantage of the quarterly meetings of the technical committee to push further for the testing of the boreholes to identify high yielding one to be mechanised by 2006. This was done and handed over to the DA through the DWST in May 2007.

Though GWCL does not have a single staff in Damongo they are still not willing to provide us with any information that can help in our work may be for fear that we will encourage the DA to takeover their system.

GWCL has source funding for some three towns including Damongo so they still have the intension of coming back but with the way we are managing this emergency system when they finish the construction of the new source we will make a strong case that we can manage it ourselves.

Currently it is the DA that is managing the system through the DWST and not the community because when we had the problem no section of the town applied for a borehole and once the DA did that we think that we can manage it better than the community. It is our hope that we manage this system sustainably to be able to keep maintaining and operating it efficiently.

Currently seven mechanised boreholes supply the town as point sources with point having six taps.

We are using vendors selected for us by the sections and they sell the water to the people and our team visits them weekly to collect the sales. Each vendor takes 10% commission.

The 36 litre container is 3 pesewas and even with power fluctuation we make between 40 and 60 new cedis per week at each point.

Currently we maintain the system but the contracted still has oversight responsibility.

At each of the seven boreholes we have raised a $10m^3$ Polytank to feed the six taps and these are filled three times a day.

The EU project has provision of household toilet facility as a component and so we have used the sections of the towns as the rural communities and we have been able to provide 250 house toilets in Damongo.

If we have more boreholes in the town it could help reduce the water problem.

2. **Customers 1**

We fetch water from the nearby hand dug wells now because it is difficult to get water at the mechanised boreholes.

If I sent my containers there now it will take me 24 hours before I will get water to come home because we are also queuing.

Because it is difficult getting water people carry all manner of containers to the taps and when it gets to their turn they will have to fill all those containers before the next person can fetch.

We pay 2pesewas for the 18litre container

No meetings are organised to talk about water from either the Assembly or any NGO

The seven boreholes for the whole town is just inadequate and so people criss-cross to other areas in search of water.

It is not like around the 1998 – 1999 when we had a lot of standpipes and we were paying 1pesewa for 18 litres of water.

We do not have toilet facilities in this area so we all go to the bush.

3. **Customers 2**

We used the borehole that has been mechanised now. But now that it is rainy we do rain water harvesting and so we do not go there.

During the dry season we stay at the borehole overnight in order to get water home. It is because people are many and also we have told that the water in the borehole get finished and we have to wait for sometime for more water to flow into the borehole before we can fetch.

We pay 3pesewas for the 36 litres of water and in a house of five people we can spend 30 pesewas (360 litres) a week.

No meetings and no civil society group interested in water issues.

Because we are not white we usually do not take notice of the time it takes to walk and wait for your turn to get water.

4. **Customers 3**

We get our water from the mechanised borehole.

We pay 3pesewas for 36 litres of water and we stay overnight before we can get water but this rainy season we do not have that problem because trap the rain water.

We know our taps are no longer flowing because the reservoir that supplies water is dried up.

In a house of about 10 – 15 you can spend 15pesewas (180 litres) a day and we that to be too much for especially because you have to wait too long to get the water.

People who fetch water and resell them charge as follows: tankers; 70pesewas for 180 litres, those who carry basins; 1new Ghana cedis for 180 litres when it is from hand dug wells and 1.20 cedis from boreholes.

No meetings are organised for us.

No civil society group in this town that is talking about water issues.

We pay 3pesewas to enter the toilet but is not always clean.

Once in a while the environmental sanitation officers come around to talk about clean environment.

5. **Vendors**

We receive between 150 – 200 hundred people a day at our boreholes in the dry season and their happy to be paying only 3pesewas for 36 litres.

We are paid 15 cedis/month as commission irrespective of how much we make for the people.

We make between 15 and 20 cedis/day.

People come from all over the town to fetch water here because of the pressures at all the boreholes.

We keep records of daily sales and meter reading for the revenue people to cross check our sales figures.
No meetings are organised with the community people but vendors join any meeting with CWSA or the NGOs that come around.

BOLE

1. **DWST, DCD, DPO and DDCD**

There is no water and sanitation subcommittee at the assembly but the social services and works subcommittees take responsibility of water and sanitation issues.
DWST is made up a technical person, hygiene educator and a community development officer with the DPO as the scheduled officer and so all reports to the assembly are to him.
The WSDB has representations from all the sections in Bole with the chief having a representative.
There conflict that was reported among the stakeholders was between the technical officer on the DWST and the WSDB so the officer has stopped attending the WSDB meeting and this is more than six months now.
The community managed system begun in 1996 but before then GWCL was managing the system.
By the schedule for water supply every house hold is to receive water every 3 days but this is not so and sometimes the taps start flowing when people are asleep.
We will rate the performance of the WSDB so far as low because all the ingredients required for good management are missing in them. They have never had a budget for their operations for the past 10 years, the have never expanded the system from the project was handed over to the community, frequent breakdowns, the DA used to fund all the operations and maintenance of the water system. WSDB does not handle their finances well and no records on their operations.
When the present DCD resumed office and realised the water system was not being run sustainably, called a meeting with the WSDB, DWST and the scheduled officer but because there was a report on the water system which showed some politics in the water supply, he advised the DCE to stay away from the meeting. At the said meeting the WSDB indicated they did not know that the water facility belongs to the DA and they did not know they cannot charge tariffs without seeking approval from the DA. It

was made clear to the WSDB at that meeting that the DA has the right to look for a private operator to take over the management of the system to generate revenue for its operation and maintenance and this was the time the WSDB members started pleading and pledged to improve upon their performance. They were then asked to go and prepare a budget for the year 2007. The DPO was finally asked to guide them in the preparation of the budget which was their first in the 10 years of operation.

The DA gave the WSDB a loan of 4000 cedis in December 2006 to be repaid within six months. After the sixth month when the WSDB realised we preparing to call another meeting they brought a cheque for 1000 cedis but asked for 2000 which they readily brought.

Sanitation is not being handled by the WSDB.

Over the years the DA showed no interest in what the WSDB does and this was because the DA thought that because the members were selected from the community they will do well.

Along the line the WSDB did not want any agency to monitor their operations and this is because over the years stakeholders forgot their roles.

The DCD who has just been transferred tried to inject some dynamism in their operations but it was politicised and so a committee was set up but the recommendation could not be implemented and that is how come the DCE was asked to stay away from the water business this time around. The DCD is seen more as a neutral person. We are very serious this time.

We believe that if our politicians stay away from this water business we monitor the WSDB well.

The WSDB has been asked to be meeting the community members explaining their operations to them and encourage them to take active interest in the water business.

The WSDB has only one account with the DCD and the WSDB chairman as the signatories.

Water flows for 5 hours/day every 3 days.

The community is always looking up to the DA to take of their water system anytime and they do not feel they have a role to play.

Flat rate of 2 cedis have been charged till 2006 when it was increased to 4 cedis a month for household connections without meters.

The workers of the water system are paid allowances monthly lower than the minimum national wage.

The revenue collectors are family relations of the WSDB members and so they do not account for the moneys they collect properly and because nothing is being done on that people feel reluctant to pay their bills.

The academic qualifications of the staff are major contribution to their inability to manage the system properly. They all have middle school leaving certificate except the accounts clerk who has a senior secondary school certificate.

Pump breakdown are the major breakdowns we have and it happens rarely. We have had one breakdown in three years and it took three weeks to be fixed. The technicians usually come from Tamale.

Institutional bills are paid by the central government.

Water quality test is done rarely and the last time it was done was in 2004.

The accounts of the water board is not audited.

2. CIVIC Union

We got involved in the Bole water issues in 2006 when there was a breakdown in the system for about one month and we heard the community members were planning a demonstration against the Water Board. This is because the consumers were thinking that it was the water board that was not maintaining the systems that is why the breakdown. Three days to the scheduled demonstration day we realised nothing was being done by the water board to stop that so we went and asked them to organise an open forum with the community at that time too the water board did not have money for that. So Civic Union agreed to foot the cost through our sponsors the GAIT an NGO.

At the meeting the Water Board members and the operators were asked questions which were clarified and all the faults of the water board and the operators were pointed out to them.

Civic Union led the water board to the assembly to source funding for the repairs of the broken down pumps. The Assembly then agreed to advance a loan for the repairs. Here it became obvious that if the tariff of 20,000 cedis flat per a house for a month is not revised the loan cannot be repaid. We helped the water board to get an increase of 100% tariff to be accepted by the community.

At the meeting the community members were told that those who are in arrears of their bills will be disconnected and in reconnection such consumers would be provided with meters and so people went ahead to pay the arrears. We then asked the water board to procure meters which they did but consumers are not willing to have meters in their homes.

Since this problem was resolved we have not had any interaction with the water board because we do not see the need but we have asked for another meeting with the community but this time the water board must fund it since our sponsors have pulled out of Bole now.

We have realised that the water board does not have any plan or budgets for the future works.

3. Customers 1

The water supply in Bole is not regular because the water is rationed. Some sections complain that it takes them more than one week to receive water.

We are not even aware when water is expected to flow in our areas. Sometime the taps start flowing around 2:00 am when people are be asleep.

Those of us residential areas are given flat rate of GHC4 a month and we also not informed when tariffs are increased. And these bills are sent to us every 28th of the month for payment to be made next month which we think is good.

The water quality is good.

The system does not breakdown often and sometimes in once a year.

We do not often see pipe leakages and we think it is because the operators are so alert and attend immediately to any leakage.

Some of us with fewer people in the house with meters pay around GHC2.4 a month but some pay more.

We cannot remember how much it cost now to connect pipe to houses.

Those of us who go to the boreholes to fetch water pay 200 cedis per 36 litre basin and at tap 18 litre bucket is 300 cedis. People depend more on wells and boreholes than the pipe water because of high tariffs.

There are no subsidies for the poor.

The new areas in town are not connected to the pipe system only households who can afford have private connections.

There are no meetings with the community on either sanitation or water issues. It is only the Civic union who organised one meeting last year.

We use public places of convenience and free range and we pay 200 cedis for each entry into the toilet and some are closed down.

4. Customers 2

No community meetings have been called to discuss the water issues.
The time for opening the pipes is always not certain and sometimes it starts flowing very early dawn when people are still sleeping.
If there are problems we only complain to the vendors who then talk to the water operators.
The water quality is good.
In our area we had some leakages but that did not take long and it was fixed.
We have not realised any breakdowns in the water system.
We pay 500 cedis for the 36 litre basin.
We have problems in getting water during the dry season and at that time too we do not have regular flow and there is always struggle at the standpipes.
Because we use well water also we cannot determine how much we spent on water per month.
People walk long distances (3Km round trip) to fetch free water because of the high tariff.
The only one public toilet in our area is so dirty that it can no longer be used and nobody comes to talk to us about sanitation.

ATEBUBU

1. Manager (AMCO Ltd)

Amco Ltd makes the recruitment of our staff but we deliberately targeted the former workers of GWSC. The CEO and system manager were interviewed and recruited by the EU the project sponsors. The CEO was a Regional Manager and the system manager was a Regional Engineer and later a District manager of GWSC but both are currently on retirement.
The initial tariffs were set by the DA but we subsequently request an increased from 100cedis to 150cedis to 200cedis and now to 300cedis/18litres.
We operate and maintain the water system and the only way our performance is measured is how regular water flows through the pipes.
There are no penalties we pay when we do not deliver as required.
Anytime there are problems we do not contact the consumers directly but we inform the DA who intend communicate to the consumers.

When the project started the consumers enjoyed 24hr water supply but after the fourth year we started experiencing some problems where we could no longer go with the 24hour supply. The EU engineers predicted that after 4 years the system will begin to face some problems.

There was an occasion when we decided to deal with individuals privately to work on our broken down machines we had to pay 27million cedis and 30 million cedis for the two machines and just after 2 months we had to send them GWCL through proper procurement process for repairs and that worked better.

The company adopts the GWCL policy on disconnection where customers are first given notices to pay up before disconnection is made. The re-connection fee is 50,000cedis which is not deterrent enough.

The demand for pipe water is higher during the dry season (December – May) and so we do not make enough revenue during the rainy season.

There is no policy on the poor.

The bulk of the population in the town use the public standpipes.

GWCL could perform better than private operators in small towns since GWCL will have different types of towns and the rich ones could help get resources to run the poorer towns. A private operator with enough capital could inject better efficiency into the water supply provision.

Customers make complaints of defective standpipes and other problems to the DA but some come to the AMCO office directly.

We do not have interference from the chiefs but they always want to have free water services to their homes.

The DCE pays for his water and so no institution is exempted only its takes up to 10 months or more to receive payment for government institutions.

Somewhere in 2005 when the company could meet the financial demand from the DA there was a threat of takeover of the system to allow WSDB to manage it.

We are expected to pay the DA 20million, the WSDB, 7 million and 10 million cedis for extensions yearly.

It is difficult working here. For 7 to 8 months now we have not been paid our salaries though the pay is not as good as working with the GWCL. According to manager he takes 3,400,000 cedis now but GWCL would have paid him 9,000,000 cedis.

The contract between AMCO and the DA is not fair.

Staff have job descriptions.

All our staff pay social security except the manager who is on retirement and income tax.
There is no training programme for staff but before the takeover we had some training.
Our company did not bid for the job we only applied and because we knew the engineers we were just called for the interview.
The staff meet at least once a month.
Our major breakdowns are pipe burst, generator breakdowns etc. At the beginning of the project we used to experience breakdowns twice a year but it is unpredictable this time.
Our river does not dry up through out the year.
No expansion of system since commissioning.
The new connection fee is 900,000cedis out of which the company takes 300,000cedis, DA takes 500,000cedis and WSDB takes 100,000cedis.
Our accounts are audited by auditors from GWCL.
The major problem facing the water system is the lack of electricity supply to the headwork which makes us pay very much for diesel always.
Sanitation is not part of the company's work and we only talk of sanitation around the standpipes and the headwork.

2. DWST

The DA does not have bye laws on water supply and sanitation.
DWST supervises the private operator and the WSDB and we also monitor them. We also give technical support to the private operator. We have been involved in the training of the WATSAN and WSDB. We have also provided the private operator with administrative support especially in record keeping.
The sub-committees involved in the water supply are the works, development and social services.
All stakeholders collaborate with each other well and so no conflicts in their roles.
The private operator proposes the increase in tariff which is passed to the WSDB then a stakeholders meeting organised before it is presented to the general assembly.
Tariff determination is mostly dependent on fuel increase and sometime on the maintenance cost.
The private operator has qualified staff; manager (HND Engineering), CEO (Engineer) and accountant (DBS).

Major breakdowns faced by the system are from the generators (4 – 5 yrs) old. 4 breakdowns already this year but it was once last year.
Depending on the availability of funds it takes up to 2 months to fix a breakdown. Technicians usually come from Kumasi.
The private operator has a numerical strength of 14 staff. This number is stated in the contract but we are discussing with the operator to reduce the number in other to reduce their expenditure.
There have increasing in household connections to new areas but there has not expansion on the main lines since the handing over of the project.
Usually it is difficult for people here to recollect easily such details of what the situation was under GWSC but the private operator took over the system immediately after commissioning of the new system by the EU. I came here in 2003.
The involvement of the private operator was the advice of the consultants and CWSA but the community.
No institution is exempted from paying bills but the central who makes the payment through the CWSA to the WSDB before the operators receives it delay. The Government institutions like the training college, secondary school, hospital etc consume a lot of water.
The water quality is tested twice a year and the quality is good except it is turbid but we have been told that since there are no coliforms it is not bad.
GWCL or KNUST does the testing.
We use chlorine powder to disinfect the water.
Water flows for 24 hours unless there is a breakdown or a problem that calls for rationing.
Source of funding for the water system is water tariffs.
For new connection a customer pays 900,000cedis without labour and materials.
The meters on the standpipes are read daily but those at households are read once a month.
The DA does not audit the accounts of the private operator and we do not check their books either. They have appointed their own auditors who audit their accounts for them.
Individual household bills are sent to the consumers directly.

The private consumers sometimes do not pay their bills and have to be disconnected and there was a time when court action was instituted against some consumers in other to retrieve payment arrears.
The record of 7litre/capita/day/person consumption of water is low because of the availability of cheaper alternatives sources of water.
Anytime the operator makes losses we do nothing but the system operation suffers.
We had a major burst pipe along the mainline which took 3-4 months before it was rectified and during that time there was no water production and immediately after rectifying the burst pipe the generators got spoilt also.
Not until electricity is extended to the headwork we will continue to have problems in making enough money from the operations.
We do not have bye laws to protect the water source but the Water Resources Commission is putting up national bye laws in that direction which the DA can make use of.
River Pru is used as the source for the water supply system and we periodically conduct inspects along it.
The chiefs say the water belongs to them so we often arrange for pacification.
The private operator does not publish any performance indicators but we sometimes organiser stakeholders meeting with opinion leaders for the operators to explain their operations.
Consumers make complaints about the water supply to the private operator, DA and sometimes they report directly to the DCE.
The complains we usually receive are about water not flowing.
For reconnection fee is only the private operator who can give that.
Membership of the WSDB is voluntary and no payment is made.
The WSDB with the support of the DA regulates the operations of the operator. But the only thing we regulate is the expenditure of the operator.
The private operator started with the operation of 2 accounts but the savings has since been closed down and they are operating one account.
The operator by the contract is to pay 5% of their profits into the WSDB accounts but because they do not make any profits they once in a while pay between 5 – 10 million into their accounts for their operations.
There are 35 standpipes but for the household connections the operator will have the figures.

Each stand pipe is designed to serve 300 people but more people have been using the standpipes.
No subsidies for the poor in Atebubu.
No civil society organisations are in the town but the youth are always asking questions.
The private operator spends about 15 million cedis per week on diesel.
No training plan for the staff of operator.
No sanitation programmes are organised due to lack of funds.
We had guinea worm cases in the town before this water supply system was provided but since we have not had any cases. But there are still other water related diseases but this cannot be attributed to our system since people still go for other cheaper alternative sources.
The DA does not have any household toilet policy but the DA has been constructing public toilets in town.
The Unit committee members are those that manage the public toilets and they charge 200cedis for entry.

3. WSDB

By government policy issues of water are the responsibility of the DA so WSDB only see to the operation and maintenance of the water system by the private operator.
We coordinate activities between the operator and the DA and see to it that the operations of the operator goes on well and when there are problems the operator pass them through us to the DA for solutions.
The contract the operator signed is such that he keeps 75% of the profits and pays 25% to the DA to share that to replacement account 10%, future expansions 5% and WSDB 10%.
The WSDB is made of 11 members 3 of who are women.
The day to day operations and all maintenance of the system is the duty of the operator but when it comes to major repairs or replacing and equipment we fall on the replacement account.
Before the project started all the sections of the town had WATSAN committees whose chairmen they picked to form the WSDB.
The roles of the stakeholders do not conflict at all. For example the WSDB reports to the DWST and they intend report to the DA.

The contract for the water system operation is between the operator and the DA but the WSDB signed a portion of it.

When the project started the EU through the consultants set the initial tariffs based on the population and the operational cost.

In setting tariffs now the proposal from the operator is send to the DA where stakeholders' meeting is called for the review of the proposal before any action. We mostly consider fuel prices and salary increases as factors in increasing tariffs.

We usually use public address system and our local FM station to announce increases in tariffs.

The risk in non payment of tariff goes to the operator but the 25% of profits is not also paid.

The operator recruits its own staff but WSDB is informed.

The contract set out 12 positions to be employed by the operator but we want the operator to reduce this number to 8 to reduce operational cost.

The major problem of the water system is the delay in the payment of institutional bills. E.g. the 2004 – 2005 bills have just been paid (56 and 188 million cedis respectively). More than 200 million cedis is still outstanding. Major water consumption on the system is from these government institutions. The operator relies largely on revenue from standpipes.

Initially the system was working very well but of late the system is having some problems and so the machines consume so much fuel and oil increasing the operational cost.

We are all witnesses to what problems the operator is going through we cannot take any action against him if he is not performing well and not paying the 25%. In the contract with the private operator, if the operator fails to report a problem to WSDB when it exists within 12 hours they are to pay a penalty of 10 million but we cannot enforce all that.

The private operator does not disconnect the government institutions but they disconnect private customers. There was a government directive that no government institution should be disconnected.

There 33 standpipes and 178 private connections.

Anytime it rains people do not use water from the pipes but the demand is very high during the dry season and that give the operator more revenue.

All staff except the DCE and DCD whose bills are part of institutional bills, pay their own bills.
WSDB and the DA are supposed to receive quarterly reports from the operator on their operations and based on the profits we should be able to calculate our percentage but we are unable to do that. All we are interested in is the payment he will make to us and if the operator makes excess money we do not care.
WSDB does not have the power to audit the accounts of the operator but the DA does not do that either and that has made the operator to contract its own auditors. The DA knows the operator does not make enough money that is why they are not bothered about the auditing.
The system started in 2002 but we are considering not renewing the operator's contract when it expires this year. It is our view that when the DA sets up an interim management team to work with the staff and we monitor the operations very we will be able to tell if the operator was not cheating us and we can have the benchmark for the new operator.
The contract with the operator is such that the WSDB does not get itself involved in the operations and the operator only reports on his own activities to the board which has no means of verifying the content of the report and so the contract is not fair.
When we started the work we were green about what we need to do and that is why we have not been able to live up to expectation but we think that we are now experience to be able to do our work well.
When the water system was completed WSDB wanted to manage the system but we were told the system was complex for us so it needs an operator and when we insisted we could do it the EU officer said it is their money and we have to do what they want.
The private operator is made up of former staff of GWSC and we thought they would have done better because they have much experience but their major problem is lack of capital and the materials the operator promised to bring into the systems never came.
The good thing about using a private operator in this town is that nobody can accuse either the DA or the WSDB for anything like embezzlement of funds.
Sometime now when the system breaks down WSDB have to go to DA to take a loan for the operator to put the machines in order.
At the commissioning of the water project the consultants mentioned that after 4 years the machines will start having problems and the DA should have put in place

mechanisms to extend electricity to the pumping station but this has not been done this is why we are having the problems now.

Our major breakdown was last year when we had a pipe burst and took 3 months to detect.

We started with 300 people to a single standpipe but as the population has increased and we have not added new ones so more people now use the pipes.

There are no subsidies for the poor because the tariffs are low enough to cover everybody.

Tariff at standpipe is 300 cedis/18litres and for private connection 11,000/m^3.

The community paid 175 million cedis representing 5% of the total cost as their deposit.

The major complain we receive is about the colour of the water because we use slow sand filters we do not use alum. The colour is more during the rainy season but sometimes in the dry season the colour is good. The natives know about the colour of the water and are used to it and that is what is used to distinguish the river water from the borehole ones. People usually do not like the borehole water.

The water quality is tested quarterly by KNUST and the report says the quality is good.

No civil society organisation present in the town.

When we were selected to serve on the WSDB we thought we were going to be paid from the 10% contribution but we cannot leave the service for people not to have water.

In some meetings we usually compel the operator to pay sitting allowances.

There are a lot of people who still because of money go to nearby unsafe water sources. This can also be attributed to the long distances to nearest standpipes.

The workers of the private operator have good working relation with each other.

The company has rented a house for workers. Staff have not been paid for more than five months now and that is affecting their output.

The staff of the operator qualified personnel but the company does not have any training plan for them. The manager has been the head of the training school for GWCL.

Every consumer has a meter.

Water flow is 24 hr except when there is a problem.

Pipe burst is our major source of water leakage and UfW is estimated at 10% of production.
Source of funds for the system is through the water charges.
New connection fee is 900,000 cedis out of which 500,000 cedis go to replacement account and 300,000 cedis going to the operator.
Paid and unpaid bills are captured in their quarterly reports. The WSDB believes in the reports we receive from the operator because we trust them and also since it is their commercial manager who prepares the report and does not benefit directly from any funds we know he does the right thing.
No bye laws to protect the water source.
The water source does not dry up.
There was an occasion when we had a pipe burst and water could not be pumped to the HLT and we could traced it, we were told that it was because the gods were not happy with the use of machines in the river that is why the water was not getting to the tank. We had to buy a lamb to pacify the river and cock to pacify another river which is considered as a friend to the river but that did not make the water to flow. So during the dry season the pool of water formed at the burst made us to see the problem for rectification.
WSDB talk about sanitation only around our standpipes though we are suppose to go around especially where we have toilets to educate people but we have no resources for that.
We do not have hands in the management of the toilets since when assemblymen rely on that for daily bread. They collect money 300 cedis for a visit but do not account to anybody and they have refused for the toilets to be privatised.
As a building policy if your plan does not have a toilet attached the building plan is not approved by the DA.
This time the sanitation issues have been taken away from the WSDB.
We have not experience any incident of guinea worm since we started using this system and is also because the guinea worm officers are carrying out their education well.
We need resources to function properly so if the operator makes profits and pay our percentage we can improve in our performance.

4. Customers.

Nobody comes to talk about water issues with us. The only people that go for meetings about the water system are the vendors.

The flow of water in our area is not regular at all. Even when water is flowing the vendors are mostly not there to serve the people.

When water does not flow or the vendors not available people go to dam or to hand dug wells to fetch water.

The water quality is not good it is coloured.

We pay 300cedis/18litres.

We cannot pipes to our homes because is very expensive. Before you get pipe to your house you may spend more than 3 million cedis.

Mostly during the rainy season they open pipes more than the dry season when we need the water most. During the dry season you see long queues at the standpipes.

We pay 300 cedis for each entry into the toilet which is always not cleaned.

We have not heard any water board in this town.

BEKWAI (Vicco Ventures)

1. DWST

The DA does not have bye laws on water and sanitation.

The private operator takes 75%, DA 15% and WSDB 10% of the revenue generated.

The contract with the operator is for 6 yr period which has expired.

No conflict in the roles of stakeholders because at the beginning of the project everybody's roles have been spelt out. There is this situation now where the DA leadership directly deals with the WSDB and communities without passing through the DWST. So there are some information we do not have. For example there is a community whose 2 boreholes were mechanised by an NGO but the DWST did not know about this but the DCD and DCE knew about it.

When the project started the tariff at standpipe was 100 cedis/18litres but is now 150 cedis/18litres.

The CWSA guidelines are followed for tariff setting.

In setting tariffs the operator proposes the new tariff through WSDB to the DA then the stakeholders meeting is held to fix the tariff.

Every private connection is metered including the fire hydrants.

No institution except fire service is exempted from bills but the incident of fire in the town is rare.

The operator recruits his own staff through competitive interviews.
We have regular meetings with WSDB and sometimes we receive complaints from consumers and we follow up for the operator to rectify it.
The complaints that mostly come is the colour of the water after the reservoirs are cleaned and washed out.
There is a disconnection plan in the contract with the operator. People do not complain about the disconnections because they are happy with the water system since it has come to solve the problems of cholera, typhoid etc.
The DA and WSDB have oversight monitoring over the private operator so any activity the operator want to under they apply to the DA through the WSDB for approval. but along the line because WSDB was not sending reports of their activities to the DA the approval of funds were stopped and that created a problem between the DA and WSDB but that has been solved now.
The WSDB operates their own bank accounts but the DCD has to add an approval note to the bank before cheques can be cashed. The WSDB does not pass this transaction through the DWST.
The DA has a local government inspector whose work is to cross check of all activities that are funded in the assembly to be sure that the right thing is done.
The records of number of connection can be found with the WSDB.
According to the CWSA guidelines for every 500m there should be a standpipe.
Since we do not see queues at the standpipes and people do not complain we think that the number standpipes we have are sufficient for the town. With the exception of the new areas the whole town is connected to the pipe system. The 75% payment to the operator is just too much and they should have been making expansions to the new areas.
The WSDB represents the towns' people and since they always present when decisions are taking it means the community is represented at decision making meetings.
No civil society organisation in Bekwai interested in water issues.
The operator hold regular meetings with customers especially when there is the need to increase tariffs or when there is a problem with the system.
The only time the operator talks about their performance indicators is when they are in meetings with the WSDB and not the whole community.

The operator knows we trust them and their staff are happy with their work but they know we say that their 75% is just too much and must be reviewed.
The operator has qualified staff but the WSDB are not qualified but they have had some training when the project started so we wonder how the monitor the operator.
The water system never experienced any breakdowns till 2006 when the pump had a problem.
Water flows for 24 hours.
No expansion made on the system.
No institution is exempted from tariff payment.
The water quality is good.
DA has been auditing the accounts of the operator.
The meter charges are indefinite which we think is not fair so must terminate somewhere.
DWST monitor sanitation around standpipes, pipelines and the pumping stations.
There are taboos that affect our operations.
Water Resources Commission has sent information round for all users of water to register their interest but we have not done that yet otherwise ownership problems.
No sanitation education.
They charge 200 cedis /visit to the toilet.
The local government law has it that any house with a minimum of 4 rooms should have a household toilet and that is what we are using.

2. Private Operator (Accountant, technical officer)

The project started in 2002.
The fee for new connection is 750,000 (plus labour and materials) out of which 185,000 cedis goes to the operator and the remaining 565,000 cedis goes to the DA (replacements account).
The WSDB has an oversight responsibility over the private operator.
Factors the operator considers to propose new tariffs are salary, fuel and electricity tariffs.
There has been an increase in tariff once since 2002.
Our profit is the driver of our efficiency.
The accounts of the operator are audited by a consultant contracted by the operator and the DA's auditors also do their independent auditing of the accounts.
The vendors take 20% of their collection as commission.

There are 41 standpipes and 396 private connections and the tariff at the standpipe is 150 cedis/18litres from 100 cedis/18litres (2002 – 2006) and the private connection pay 7150 cedis/m^3, equivalent to 130 cedis/18litres from 5,500 cedis/m^3, equivalent to 96 cedis/18litres (2002 – 2006).

Distributions of bills are done monthly in the first week of the following month.

Government institutions do not pay their bills in time but they consume most.

All staff of operator are qualified and they are 10 people in all.

The private operator does its recruitments.

In 2003 we had a breakdown due to an electrical fault that caused fire outbreak. In 2006 one of our pumps had a breakdown but none of these breakdowns caused an interruption in water supply. Road construction has been causing pipe burst (2006).

We had to use 9 days to rehabilitate our HLT this year and cleaning of the tanks take two days and we do that twice a year.

The operator pays for all maintenance cost.

Water is tested twice a year from KNUST.

A minimum of 15% is set aside for UfW but in 2006 because of the pipe burst we registered 50%.

The peak demand period is the dry season. As for the raining season a lot of people do water harvesting and use other alternatives.

Flow of water is 24 hours all year round.

Meter rentals is 5000 cedis /month

Metering of household connection is done at the distribution box so all leakages along the lines measured as consumption so we do not have problems of illegal connections.

The role community members play is by reporting faults, payment of their bills regularly, attending community forums, the formation of WSDB and tariff fixing because before any increases in tariffs the operator sends the proposal to WSDB which represents the community.

Unless there is a public forum the operator does not have direct contact with the people regarding information flow.

We have community interaction/briefing 1 – 2 times a year this was common at the beginning of the project but sometimes also this is done at the request of NGOs.

We do not have complains unit but we receive complains always in the office. The complaints we receive include, tariffs, meters and colour of water especially when work has been done on the pipelines or we flushing water.

We believe the community is happy with our operations otherwise we would not have been allowed all these years here.
More than 90% of the town is served with water.
No expansion has been made to the system since its construction.
People still use their hand dug wells and sell the water to other people who still feel water from hand dug well is sweeter to drink than the pipe water.
We have very good working relation with the DA and we think they trust us. Other DAs, WSDBs, CWSA regional and national have been coming to see how we are running the system and the compliments given by the DA to this people show the level of confidence they have in us.
Every staff receives his/her salary regularly every month and we pay our SSNIT contribution and income tax. We are paid yearly bonuses we are paid allowances during Xmas and Easter, rent and 50% of medicals bills before the implementation of NHIS.
We cannot disclose our salaries to you please.
Our income is shared as follows with DA and WSDB; 15% to DA through the replacement account, 10% to WSDB part to be used for sanitation and operator 75% for operations, maintenance and profit.
WSDB now take sitting allowances from the 10% which they used not to take.
We have had training from KNUST and the company paid for it.
We have staff meetings to discuss our welfare and operations.
The operator provide chemicals, brooms etc to the vendors to clean around the stand pipes.
We have more women as vendors than men because it appears the women have more time and appreciate the 20% commission than the men.
The signatories to the WSDB are accounts are one person from the WSDB and another person from the DA and so WSDB does not have control over the money.
The boreholes used as so of water have been yielding enough water throughout the year. We have been told they will last for a minimum of 10 years and so two standbys were provided.
After the distribution of bill we allow for two weeks for customers to pay after that we have the right to disconnect we usually take the amount involved into consideration.
It took three years for us to receive payment for the first institutional bills to be paid.

The reconnection fee is 50000 cedis and people come to beg not to be disconnected and so in some cases we do not take the fees.
The DA and WSDB regulate our performance.
We do not have any civil society organisation in town interested in water issues but we ever addressed a forum organised by an Obuasi based NGO GAIT(Government accountability and Integrity Trust) for all the utility companies in the town.
The private operator has recently signed three additional contracts with some districts in Greater Accra and Volta Regions to manage their systems.
The major challenge for the operator now is how to get the outstanding bills from government institutions and the private customers.
For two years now the hospital owes the water system more than 80 million cedis.
Accounts receivable is 84%.

3. WSDB

There are no conflicts in the roles of stakeholders.
To get any increases in tariff, the operator brings the proposal to the WSDB for discussion with other stakeholders such as leaders of the various segments of the town.
The operator does his own recruitments of their staff.
The vendors operate under the private operator and they do the selection but we monitor the operations of the vendors. So when there are complaints about their performance we call them for meetings. We have fixed a meeting for next week because of the complaints of opening and closing times, helping customers to raise basins and pans onto their heads at the taps.
We usually check the performance of the operator by checking if water is flowing regularly, vendors' commissions and the 10% and 15% payments to WSDB and DA respectively. The 10% and 15% payments were mutually agreed upon at the beginning of the project.
Before any customer is disconnected he/she receives a demand notice after one month of default and then two months without payment the disconnection takes place.
Reconnection fee is 50,000 cedis.
WSDB and the DA regulate the operator.
WSDB has a bank accounts but it is controlled by the DA. Initial one member of WSDB signs and the DA counter signs the cheque that has stopped now so anytime

we need money we go to the DA directly. The Regional office of CWSA is working to get the issue solved.
We have idea as how many standpipes and household connections we have but this is on paper and is not here now.
The maintenance of the system is the responsibility of the operator and the DA.
At the beginning of the project the town contributed 78 million cedis towards it and each person paid 5000 cedis.
Customers make complain to either the WSDB or the operator and they are happy with how we handle the complaints.
The operator and the WSDB called for a public forum in 2006 to discuss the water issues but people did not turn up and we have not done this year. We are supposed to be calling such public forums quarterly.
We do not have any public education campaigns.
The chief of the town is always briefed of what the operator is doing since the WSDB secretary is also a member of the town development committee which is always into regular meetings with the chief.
The staffs of the operator always get us to present any grievances to their management for redress. E.g. the pump attended who did not have a motor bike pass it through us and has received it and the other staff needed mobile phones which have been done through our intervention.
The staffs of the operator are qualified people.
Problems at the pumping stations are the major breakdowns face the system but this do not happen often and took us four weeks to get it fixed when we had the breakdown. This did not affect the flow of water to the town since we depend on four boreholes for water supply.
The WSDB does not have any idea on expansions made since commencement of system.
No institution is exempted from paying tariffs though the chief wanted supply to the palace for free.
Government institutions are the major defaulters in the payment of bills.
Water testing is done twice a year.
Water flows through the pipes 24 hours/day
During the construction of the main road we had a pipe burst and that caused a lot of leakage.

Tariffs are the only source of revenue to the operator.
New connection charge is 750,000 and a part of this is paid to the DA through the replacement account.
Electricity tariff is a major influence on our water tariff here.
The system operated for 5 years before we increased the tariff from 100 cedis to 150 cedis/18 litres.
The DA audits the accounts of the operator but has never given the WSDB the audited reports though we ask for it every time.
No taboos that affect our operations.
The major problem faced by this system is the delay in the payment of institutional bills by the central government.

4. Customers 1

At the beginning of the water project we were regularly having meetings with people because we were contributing some money to the project. For now it is only vendors that hold meetings with the operator and the WSDB but for the consumers it is only when there is a problem that they meet us and explain the problems.
The pipes are usually closed when they want to wash the tanks and that takes 3 days to complete and this is done 3 times a year.
The problem we have with the water system is sometimes the colour change in the pipes otherwise everything is going on well and we are satisfied.
There are no civil society organisations in the town.
The chiefs get involved in the water business when there are problems and the communities need to be mobilised.
When there are problems about the water we complain to the vendors who then report that to the operators and we are satisfied with how the complains are handled.
Few people have household connections in this community because of the cost involved and the standpipes are not enough.
The water flows for 24 hours from the distribution but the vendors usually close the taps and go to their personal businesses. And in the private houses in other to bring down our bills we have times that we open and close the taps so a house of 20 – 40 people we can pay between 40000 – 60000 cedis/month.
No leakages have been seen around this community.
We have household meters and the standpipes also have meters.
There are boreholes we buy water from also in the community.

The readings of household meters are taken at the end of the month and within a week or two they bring us the bills.
We have no taboos associated with our water system.
WSDB only talk about sanitation only when there is an outbreak of cholera or other diseases. This happened once since the project started.
We have both public toilets and household toilets in the community but no money is paid to enter the public one but when it gets full the community members make contributions for it to be discharged.
Water flows in this community throughout the year.

5. Customers 2

Before the project started each person in the community paid 8000 cedis which we saw to be expensive. In some cases threat of police and court were used to get some people to pay.
There is a river close by which we us alongside the pipe water.
The water from the taps are not considered sweet here so there are people in this community who have never drunk the water from the tap but prefer to drink from a nearby borehole which they consider sweet.
Sometimes the water from the taps gets very coloured and we have to pour such water away when it comes.
We do not make any complains to anybody about the problems because we live with those that we will be complaining to and they see the colour and they know the taste is not good.
A lady from this community went to the hospital of an illness and was told that the water that she drinks has given her typhoid.
The water system has help to reduce our water problem especially during the dry season when our river dries up.
The number of standpipes we have here are rather limited.
Anytime the operator wants to put off the pipes for any repairs or cleaning the whole town is informed through the local FM. For this year (2007) we have not experienced any shut down but it happened 3 times last year and anytime it happened it took three days.
In our community the water flow at the standpipes are controlled by the vendors at their convenience. They open the taps two hours in the morning and two hours in the

evening though the pipes flow 24 hours. Those with household connections have access 24hours/day.

We pay 150 cedis/18litres at the standpipes.

We pay up to 1000 cedis/day for water for the 7 days of the week.

We do not pay for the use of the public toilet but we contribute to for the removal of the waste by a tanker when the toilet gets full. The children clean the toilet once a week.

6. Customers 3

Before the project started every individual was involved because we all made monetary contributions towards the capital cost of the project.

During the dry season water does not flow regularly because when the taps are opened after a short while some areas face reduced flow till it stops.

The water quality is not good because the colour of the water is like our river.

No meetings have been organised by either the operator or WSDB with the community since the handing over of the project the management.

Any time the operators want to stop the taps to wash the tanks they make announcement before the closure.

We do not think we have anybody to complain too when there are problems because when you are vocal people think you are something else.

We have WSDB is there but it is not working properly because they have no money to operate well.

The chiefs are represented on the WSDB but they have never called us to discuss the water issues.

The breakdowns are not regular.

It is expensive to have household connection so very few people have connections.

We pay 150 cedis/18litres.

We pay between 8000 – 9600 cedis/week for a family of 6 people.

The mode of payment at the standpipe is good.

There are no water leakages in town.

We have public toilets but we pay 200 cedis/visit and the assemblymen are responsible for the day to day collection of the money.

No sanitation education is organised but announcements are made when the DA wants us to clean our environment.

AKATSI

1. DWST

The water project which started in somewhere in 2001 was sponsored by KfW. Before then we were depending on hand dug wells.

DWST is provided with two vehicles through the DANIDA rural water programme.

At the beginning of the project the DA was to pay 5% counterpart funding and the town also to pay 5% but the community could not pay and the DA took that up and paid for the town.

The WSDB gives the DWST quarterly reports.

The WSDB set the tariffs but the DA approves it.

The WSDB were trained by the consultants on how to set tariffs. They take into consideration electricity tariffs, operational cost of the system etc.

The WSDB recruits the operating staffs.

The WSDB operates a current account for the operations of the water system and a replacement account for investments.

Source of funds to the WSDB accounts are from the water sales.

The signatories to the current accounts are the WSDB chairman and treasurer but the DA controls the replacement accounts.

A percentage of the water sales is paid to the replacement accounts quarterly.

DWST monitors the WSDB while the WSDB intend monitor the operating staff that they employed.

We always check the water consumed against the revenue generated and income and expenditure of the WSDB.

The WSDB holds monthly board meetings but they do not hold community meetings to render accounts though in their facility management plan it is captured.

The WSDB tried to disconnect defaulting customers sometime back but could not be executed.

The private connections are metered with meters bought by the WSDB.

It is expected that when WSDB is not calling for community meetings it is the responsibility of the community through their elected assemblymen call the WSDB to hold such meetings.

There are 30 standpipes but we cannot tell how many private connections that we have in the town. Every standpipe has a meter and this is read every week the money calculated and collected from the vendor.

The WSDB selects the vendors but the DWST does not know the criteria they use.
At the standpipe the tariff is 200 cedis/18litres which was initially resisted by the towns' people, but with time accepted it.
Everybody in the town has access to the water facility either through the standpipe or the private connection.
The travel distance to the standpipe in the town is less than 500 m.
No subsidies for the poor in the town.
There are no complains to the WSDB or DA about the water system and we believe it is because a lot of the private customers are owing the WSDB.
No civil society organisation present in the town but when there was an attempt to privatised the system the assemblymen went all out to resist that. But the DWST thought it was a better way of making the system to run sustainably because the private operator would have been given an amount to pay to the DA every month and when they more it becomes their profit. These household debts would not have come up.
All five chiefs in the town take part in the water programmes.
The operating staff complain about their salaries. The accountant who is the highly paid receives 500,000 cedis/month and the watchman takes 300,000 cedis/month as the least paid.
The consultants trained the WSDB and the operators about three times when the project started.
The people are only trained on the job but did not have the requisite qualification.
We had a major breakdown last year and it took six months to rectify and it affected water supply and a lot of money was used in the repairs. This problem happened when a technician who had worked with the construction company and later employed by WSDB blocked the HLT inlet after he was sacked by the chairman. This caused pipe burst severally and the DA had to go for the Chinese contractors to come and identify and to solve the problem. This is the only major problem faced by the system.
In 2006 there was expansion of the water system to another community very close to Akatsi.
Only the fire service that does not pay for the water they use.
Water is tested for quality once in a year at the request of WSDB.
Water is opened for 8 hours a day during both rainy and dry season.
The accounts of WSDB are audited by DA appointed auditors.

In the first week of the succeeding following month bills of the previous month and to be paid at the month.

Land owners at where the boreholes are situated are asking for compensation other people have been asking money to pacify the gods the undue withdrawal of the groundwater.

The WSDB has somebody with sanitation background so he goes on educating people about sanitation.

There are public toilets and the various assemblymen are responsible for their management.

We have six boreholes but only three are currently functioning due to the submersible pumps but this has not affected the flow of water to the town.

2. WSDB and Operating staff

The project started in Nov 2003.

The HLT were have is 380 m^3.

There 36 standpipes and 185 household connections.

Water tariffs are 200 cedis/18litres at the standpipes and 11600 cedis/m^3 and this has been the tariff since the project started.

All public pipe attendants (PPAs) as the vendors are called pay their money every Friday to the WSDB office.

Pipe burst are not common but when it is ploughing time some pipes get burst sometimes 3-5 times a year but when this happened it does not take more than 2 hours to fix.

There are six boreholes that have been mechanised for use by the water supply system.

Water flows to the general public between 8-10 hours.

People do not patronise the water system during the rainy season because of the availability of cheaper alternatives.

Electricity is the prime mover of any increase of our tariffs.

The operating staff are not on salaries and so do not pay social security and income tax. WSDB members are volunteers.

WSDB runs two accountants; the current account which signatories are the board chairman and the treasurer and a savings account which is controlled by DA.

We do not have fixed amount we pay into the two accounts but all depends on whether we make money or not. After paying our debts and staff allowances if there is still money we pay it to the bank in our current account. The highest amount of money we ever paid to the savings account since the project started is 5 million cedis but we have now been paying 500000 cedis when we get money. This year we have paid twice and last year we paid four times.

WSDB recruits the operating staff but the recruitment is not based on any specialised qualification but the ability of the person to read and write. The accountant is a trainee of a private accounting school and the computer clerk is trained by a private computer school.

The WSDB chairman acts the system manager and he works with the secretary who also doubles as the technical person on the board and he is a retired technician of GWCL.

The work of the WSDB is monitored through the amount of money we are able to make.

We disconnect our customers who default in payment of their bills and the reconnection fee is 10,000 cedis.

We have just set up a task force to follow up on defaulting customers to collect the payments.

We started putting down records for our operations in 2005.

No subsidies to any group of people so any one who feels our tariffs are high go to the boreholes to fetch water at cheaper rates 100 cedis/18litres.

Community meetings are held 3 times a year but this year we could not make it the first time because the attendance was poor but we have reschedule it. At the meetings we discuss our accounts.

The complaints we receive from our customers are about high tariffs but to get this tariff we met the towns' people and the DA.

No civil society organisation.

The staff are trusted because they are always with the WSDB members in the office we do things together but people outside feel that the accountant is embezzling the money from the water sales.

The WSDB makes some money and we use this to fix our breakdowns for example last year (2006) we spent 60 million to repair our pumps and these money came from our sales.

We do not have any training plan for the operating staff and the WSDB members but anytime there are training programmes by CWSA we send people. Our fear has been that when our operating staff are trained and become expects we might not be able to meet their demands of increasing allowances and we can lose them so we are very careful.

We do not estimate our UfW but they could be high when the pipe burst. There are no cases of illegal connections in the town.

Our accounts are audited regularly.

We distribute bills towards the end of the month and we expect people to pay by month ending.

We have a sanitation officer amongst us and he carries out sanitation education in the town.

The boreholes supply the water has never ran out of water either in dry season or rainy season.

No taboos about the water but the land owners are requesting for compensation.

WSDB does not have hands in the management of the public latrines which majority of the people rely on and free range.

No water borne diseases reported in the town.

The welfare of the operating staff should be looked at if we want to make any meaning to our work.

3. Customers 1

We fetch water from the standpipes and we pay 400 cedis/18litres.

An average of five people in a house will spend 6000 cedis/week.

No meetings are organised with us by the operators.

We do not complain of anything.

It is difficult to use the water to wash our clothing and we have to use much soap.

Before the construction of the water project we used to draw water from the stream.

The water is opened from 7:30 am to 1:00 pm.

The vendors are always available at the standpipes all the time.

In the dry season the pipes flow for just one hour a day and stop so we struggle to get water.

When the pipes are not flowing we go to buy from private hand dug wells.

We do not experience any water borne diseases.

There are some places where there are no standpipes.

We do not have household toilets so we pay 300 cedis/visit or go free range.

4. Customers 2

We pay 200 cedis/18litres at the standpipe.
In our area the pipe open from 7:00 am to 5:00 pm and the vendors are always available.
It is so expensive to put pipes in our houses.
The water is difficult to use in washing and we complain about this to the vendors but they don't tell us anything.
Sometimes we see dirt in the water and we complain about that too but this happens when the tanks are washed and we pay for the dirty water as well.
In some places in the town people pay more than the 200 cedis/18litres.
In our houses the average use of water is 18litres/person/day.
Some other people do not drink the water from the pipes because it is not sweet but we buy sachet water for drinking.
Our water flows always around here.
Majority of the people don't have pipe in their homes.

5. Customers 3

We do not have standpipes in our area but we also need it here but some people have pipes in their homes and they sell the water 500 cedis/18litres to us.
We fetch from the private hand dug wells and we pay 200 cedis/18litres and we know the pipe charges the same amount.
The operators have never come to talk to us and we have never been invited to any meeting about the water.
If we are asked to contribute for pipe water to be extended to us and the money is not too much we will pay.
We don't drink the water from the well but we mostly do during the dry season.
The water in the well does not finish in the dry season.
We have not heard about any unit committees in our area.

ASIAKWA

1. DWST

We have not been involved in their activities because we are all new officers in this district but it seems the project started in 2003.
We do not have direct responsibility over the water system for now but we are putting in mechanisms to begin monitoring them.
The WSDB has been sending us their quarterly reports.

The major problems we have so far heard are the frequent breakdown of the aqualine machine and sometimes pipe burst.

2. WSDB and accountant

The WSDB has been running the water system since the project started in Oct 2003. The work of WSDB is a voluntary and we do not have anybody who has the time to see to the day to day responsible of the operations so the chairman was asked by the board to take charge and coordinate the operations of the system and report directly the board.

The water system has 7 operating staff in total with 19 public pipe attendants.

We pay 20% as commission to the vendors monthly though they submit their sales weekly.

The vendors are monitored by matching their meter readings against the moneys they bring and if the money is not up we deduct it from their commission.

We recruit vendors through soliciting applications with guarantors and selection is based on the guarantors and the proximity to the standpipes.

Though the pipes are opened 24 hours/day the vendors work between 5:30 am – 10:00 am and 2:00 pm – 5:30 pm. However in between these times some vendors still serve people.

300 people are expected to us one standpipe.

No conflicts in the roles of stakeholders and we are all satisfied with our work.

WSDB operate two accounts, a current account with signatories as chairman, treasurer and secretary and replacement account which is controlled by DA.

Every month 20% of our income is paid into the replacement account but for this month (sep 2007) because of rains we have not been able to raise enough money to pay into the account.

WSDB determines the salary of staff.

The technical staff we have on the system worked with the contractors and were just shifted to the operating system but for the security and accountant the WSDB recruited them. The DA was represented at the interviews.

The DWST members who were working closely with the WSDB in managing the system have been transferred and the new people are not forceful.

We had a meeting last week with the DWST and the new members were briefed on our activities and we have agreed to be having regular monthly meetings with the DWST.

The tariff is set between the DA and WSDB but we have never set or increased tariffs as the current tariff was set by the consultant at the commission stage. The tariff was initial set at 250 cedis/18litres due to agitation from the customers after two months it was reviewed to the present 200 cedis/18litres.
We prepare the statement of accounts of the water system and present to the customers every quarter. We organise such meetings through beating of gong-gong and the meeting takes place at the funeral grounds.
We do not have performance indicators on which we are measured but anytime something goes wrong the customers complain. All they want to see is water flowing.
We do quality test every six months.
People do not come to the office to complain but comes to us as gossips.
We disconnect private customers who do not pay for about a year or less than a year if the amount involved is huge. We first send a demand notice before the disconnection process.
Reconnection fee is 100,000 cedis.
We have 60 household connections and 19 public standpipes and we receive more money from the standpipes than the household connections.
The average consumption is 18 – 27 litres/person/day. Average household size is 5.
No subsidies for the poor and no exemptions.
We give the vendors 9000 cedis/month allowance on their sales to be used for washing and cleaning around the pipe. This is credited to the vendor she uses less than the allowance.
The community does not take part in the decision making apart from when we are to set tariffs.
The pipes are opened 24 hours/day.
We used to have some electrical problems at the submersible pumps, pipe burst etc and these cause breakdowns which last for 3 – 5 days affecting water supply. It happens 2 – 3 times a year. Our major problem of voltage fluctuation has been rectified with stabilising equipment and since we have not experience any problem with the submersible pumps.
No civil society organisations.
Our chief does not play any major role in the day to day operation but has a representative on the WSDB. We have to inform the chief when we want to beat the gong-gong to call people for meetings.

We have attended some training programmes organised by DANIDA but we do not have our own training plan. The consultants on the project organised series of capacity building workshops for the WSDB before and after we took over the operations of the water system.

We are always ready to upgrade ourselves.

WSDB meets regular and we mostly discuss our welfare and the operations of the system.

We pay the social security contribution of the staff but we do not pay income tax because our system is not a profit making venture and our operation is rather helping the government to provide water to the people.

Our staffs do not have high qualification but have worked on similar programmes so have the needed experience to do the work. The technical staff though MSLC holders have worked with GWSC and the accountant is GCE O level holder.

The contractor comes from Accra to repair any breakdown for us.

We charge 1 million for new connection which include a new meter and its accessories.

We do not have meter charges.

Our UFW is put at 10 – 15%

No institution is exempted from paying bills and we do not pay any amount to the DA.

The DA has not supported the system financial since we took over.

Our accounts have never been audited.

We take meter readings on 27/28 of the month and distribute the bills by 30th and we require payment by 15th of the following month.

We have only one public toilet in the town which is controlled by the chief.

People pay 100 cedis/visit.

WSDB has asked for permission from the DA and we are using 20 million from our account to build household toilets in the community and this started last year. We expect beneficiaries to use 1 and half years to pay back to the WSDB.

We have water to pump all year round.

We do not have any taboos that affect water supply but at the beginning of the project moneys were paid to pacify the gods of the town some moneys to the chief.

No water borne diseases.

The water system is still fairly new so we do not have serious problems yet.

3. Customers 1

We all fetch water from the standpipes.

The vendors do not open the pipes throughout the day.

We pay 200 cedis/18litres.

No meetings are organised between us and the operators but they always hold meetings with the vendors.

We do not make complains but anytime the pipes are not flowing we go to ask why.

No civil society organisations.

We do not see pipe leakages around.

We do not have money to put pipes in our houses and some of us are tenants and we cannot tell why our landlords have not put pipes in the houses.

We have only one public toilet in the town and we pay 300 cedis /visit.

Appendix III

HOUSEHOLD SURVEY

(Please fill in the name of the town, Date of the interview, house code and your name below)

Name of interviewer: ....

Name of town: ....

Date of interview: ....

Compound house code: ....

Starting time: ....

Finishing time: ....

(Please when you enter a house go to the household whose door is directly facing the entrance. Greet the first person you meet and asked to talk to the head of the household if the head is not there ask for the next in command)

Good morning/afternoon/evening. My name is.............. I am part of a research team that is investigating how your towns' people are coping with the current water supply situation. Your responses will be treated confidentially and will remain anonymous and will only be used for academic purposes. It is believed that your responses will help the research to draw the relevant conclusion and the recommendation thereafter could be used for the long term improvement of your water supply system and it has nothing to do with the current political activity in your area. It is therefore our hope that your answers will be as accurate as possible. We would therefore appreciate it if you could spare some time to answer some few questions.

(Please thank respondent if he/she agrees to be interviewed. Do not insist when respondent is not willing to be interviewed but thank he/she and leave)

SECTION 1: *(Introduction: This section is find out household sources of and expenditure on water in both dry and rainy season, water consumption and how water is stored for times of shortage if any)*

Q1. a) Please can you tell us where your household draws its main water supply from in both rainy and dry seasons *(Do not prompt)* and how much you spend on each source in a day? *(If payment of water is on monthly bills please asked for receipts for the last six months and quote the figures)*

Use	Rainy season		Dry season	
	Source *(tick as appropriate)* Expenditure		Source *(tick as appropriate)*	Expenditure
Cooking and	..... 1. House pipe		..... 1. House pipe	

drinking	..... 2. Public stand post ..... 3. Neighbour's house pipe ..... 4. Vendors ..... 5. Well (own/public/neighbour) ..... 6. Stream/river ..... 7 Borehole ..... 8. Pond/Dam ..... 9. Other (please specify)...........		..... 2. Public stand post ..... 3. Neighbour's house pipe ..... 4. Vendors ..... 5. Well (own/public/neighbour) ..... 6. Stream/river ..... 7 Borehole ..... 8. Pond/Dam ..... 9. Other (please specify)...........	
Washing and bathing	..... 1. House pipe ..... 2. Public stand post ..... 3. Neighbour's house pipe ..... 4. Vendors ..... 5. Well (own/public/neighbour) ..... 6. Stream/river ..... 7 Borehole ..... 8. Pond/Dam ..... 9. Other (please specify)...........		..... 1. House pipe ..... 2. Public stand post ..... 3. Neighbour's house pipe ..... 4. Vendors ..... 5. Well (own/public/neighbour) ..... 6. Stream/river ..... 7 Borehole ..... 8. Pond/Dam ..... 9. Other (please specify)...........	

Q1. b) Please can you tell us why your household resort to the sources you mentioned earlier mentioned above? *(Please write in block letters and clearly)*

Use	Rainy season	Dry season
Cooking and drinking		
Washing and bathing		

Q2. a) When you collect water from the source(s) mentioned above *(please refer and mention)* how does your household store it for daily use? *(Do not prompt)*

.....1. Bucket (18litres)
.....2. Small “jerican” (25litres)
.....3. Aluminium Basin (36litres)
.....4. Big “jerican” (50litres)
.....5. Barrel (225litres)
.....6. Other (please specify)

Q2. b) How much of the water in Q2a) above does your household use in a day? .... *(If household uses metered connection please record their monthly consumption for the past six months)*

Q2. c) Do you think the amount of water use by your household in a day is adequate?

.....1. Yes.

.....2. No.

Explain.

Q3. How long does it take a member of your household to go and return from fetching water? ....

Q4. a) Does your household have large storage facilities for storing water for future use?

.....1. Yes.

.....2. No.

Explain further the reason for your choice

If the response is Q4a) No, go to section 2 and if yes continue from Q4 b).

Q4. b) How many of such storage facility do you have, what is the size of each storage facility, when was the storage facility acquired and how much did each cost?

Size of storage facility	Number	Year of acquisition	Cost of storage facility	How long does it take to finish the water in storage

SECTION 2. *(This section is to find out how consumers are satisfied/dissatisfied with services they received from the water providers. Prompt)*

Indicate your level of satisfaction or dissatisfaction from a scale of 1 to 5 where 1 very satisfied and 5 is very dissatisfied, with the water quality, hours of flow of water per day, water pressure through taps, complaints handling, queues at water points and tariffs paid for water. *(Please circle one for each question)*

	Very satisfied	Satisfied	Neither satisfied nor dissatisfied	Dissatisfied	Very dissatisfied	Don't know
	1	2	3	4	5	6
Q5. Water quality	1	2	3	4	5	6
Q6. Hours of flow of water per day	1	2	3	4	5	6
Q7. Water pressure at taps	1	2	3	4	5	6
Q8. Complaints handling by service providers	1	2	3	4	5	6

Q9. Queues at water points	1	2	3	4	5	6
Q10. Water tariff	1	2	3	4	5	6

Q11. Would you be willing to pay more for your water supply if the current water supply services were improved?

.....1. Yes.

.....2. No.

Why?

SECTION 3. *(This section finds out more about the household and household income)*

READ: We will want to know a little about your household because that is very important to do a better analysis of the water situation in your town. Once again we want to assure you that any information you provide will be treated confidentially and kept anonymous and will only be used for academic purpose so feel free and please provide accurate answers.

Q12. a) How many members of your household have been living with you for the past one year? ....

Q12. b) If you would not mind, could you tell us your *(head of household)* educational background? ....

Q12. c) How many other households live in this house with you? ....

Q13. Which of the following items does your household possess? *(Prompt and tick)*

.....1. Car........

.....2. Motor bike........

.....3. Bicycle.........

.....4. Television set..........

.....5. DVD/Cassette player........

.....6. Own a house......

[Please make notes of some observations about the household E.g. nature of apartment or front door, dressing of children, types of water storage containers, cooking pots, place of cooking, etc.]

Q14. How much does your household pay averagely for electricity in a month? ....

Q15. a) How much does your household spend on your own mobile phone a week *(Indicate if expenditure is per day/month)*? ....

Q15. b) How much does your household spend on your own landline in a month? ....

Q15. c) How much does your household spend on “space – space” *(Per day/week/month whichever is appropriate)*? ....

Q16. a) Are you into crop and tuber production?

.....1. Yes.

.....2. No. *(If Yes ask the follow up questions and if No go to Q16b)*.

How much crops and tubers did you produce and how much did you sell within the last twelve months?

Produce	Quantity produced (bags or 100 tubers)	Quantity sold	Price/unit (bags or 100 tubers)

Crops and tubers a) b) c) d)			

Q16. b) Are you into animal husbandry, poultry raising or aquaculture?
.....1. Yes.
.....2. No. *(If Yes ask the follow up question and if No go to Q16c).*
How much of these livestock did you sell within the last twelve months?

Animals, poultry or aquaculture	Number sold	Price/ each	Number unsold
a) b) c) d)			

Q16. c) Does the household or any members of your household have private businesses or into trading of any kind?

.....1. Yes.

.....2. No. *(If Yes ask the follow up question and if No go to Q16d).*

How much have you earned from the business or trading within the last twelve months?

Business or trade	Earnings
a) b) c) d)	

Q16. d) Does any member of your household received remittances (Money transfer) from anybody either within Ghana or outside Ghana within the last twelve months?

.....1. Yes.

.....2. No. *(If Yes ask the follow up question and if No go to Q16e)*.

How much did you receive on each of the transfers?

Transfers received at a time	Amount
a) b) c) e) f) g)	

Q16. e) Does any member of your household rents out his/her own house or land?

.....1. Yes.

.....2. No. *(If Yes ask the follow up question and if No go to Q16f)*.

How much do you earn on the rent in a month?

House or land rented out	Amount/month
a) b) c)	

Q16. f) Is any member of your household in any employment that he/she earns income from?

.....1. Yes.

.....2. No. *(If Yes ask the follow up question and if No go Q16g)*.

How much does each member earn monthly after tax and social security?

Member	Monthly earning
a)	
b)	
c)	
d)	

Q16. g) Is there any other source of income to the household within the last twelve months?

.....1. Yes.

.....2. No. *(If Yes ask the follow up question and if No go to Q17)*.

How much did you receive each month?

Other sources	Amount
a)	
b)	
c)	
d)	
e)	
f)	

Q17. Please does your household income vary with the annual seasons?

.....1. Yes.

.....2. No. *(If the response is yes ask respondent to explain why it is so).*

Thank you very much for your time.

Please write in BLOCK letters your observation about the household regarding:

1. *Type of cooking materials and place*
2. *Appearance of children if any*
3. *Nature of front door to household room*

Appendix IV

Subjective Capacity Descriptions	**Scores**
Leadership	
Provides clear sense of mission; involves people with mission; gets people excited about mission, believing in it.	
Serves as a positive role mode, hard-working, demonstrates competence, is visibly interested in work, and balances people needs with organisational needs.	
Shows sense of dynamism, enthusiastic, has an active 'can do', problem solving attitude.	
Demonstrates personal integrity, instils sense of integrity in others, and balances personal ambition with organisational needs.	
Is oriented towards producing results which move work towards meeting objectives.	
Identifies clear performance standards both at institutional and personal level and is strict but fair; gives positive and negative feedback where due.	
Visits staff at all levels of the organisation and all districts on a regular basis.	
Listens as well as instructs.	
Has sufficient operational and technical knowledge to inspire trust	
TOTAL LEADERSHIP	
	Total/9
Organisational Autonomy	
Sets own organisational objectives and changes them as necessary to provide guidance and direction in achieving the objectives of the organisation	
Prepares annual capital and operating budgets linked to revenues and needs; successfully obtains approval for budgets	
Establishes and implements levels of tariffs and service charges sufficient to meet capital and recurrent costs	
Maintains control over revenue generated	
Establishes and maintains staffing levels sufficient to meet needs	
Employs, discharges, disciplines and promotes personnel within established and approved guidelines according to institutional needs	
Establishes levels of employee compensation including salaries and benefits sufficient to attract and maintain capable staff	
Top management is well informed about external policy, financial and regulatory issues and actions	
Top management maintains direct contact with the key individuals in all important external entities	
TOTAL ORGANISATIONAL AUTONOMY	
	Total/9
Management and Administration	
Managers have a clear sense of their own and other's roles and responsibilities	
Managers communicate roles and expectations clearly to others and involve them in defining their roles and responsibilities; they promote teamwork	
Managers trust their subordinates	
Managers regularly set goals with staff and have a sense of priorities	
Departmental/section objectives and performance indicators are clear and understood by staff and are achieved at the desired level of quality	
Staff are held accountable for getting work done according to agreed performance indicators	
Managers seek to innovate and develop new ways of achieving their objectives, through technical and managerial means	
Administrative systems for budgeting, accounting for all assets, procurement and personnel and staff development have been developed and are regularly used	
An effective Management Information System has been developed and is regularly used	
Technical information is routinely shared among planning, design, construction and operational units	
TOTAL MANAGEMENT AND ADMINISTRATION	
	Total/10

Commercial Orientation	
The institution achieves a yearly balance between expenditures and revenues.	
Tariffs include payment for capital expenditure through depreciation of fixed assets	
Budgets are set according to negotiated priority levels for quality	
Expenditures are monitored against agreed budgets	
There are annual, published, audited financial records	
Staff actions throughout the institution are guided by cost effectiveness as well as quality standards	
Staff belief in a commercial orientation and think of their service function as a business	
Services are contracted out which can be run more efficiently by private enterprise or community organisations	
TOTAL COMMERCIAL ORIENTATION	
	Total/8
Consumer Orientation	
Staff at every level demonstrate that they are oriented towards serving consumers; when observed their decisions and actions are clearly driven by what is best for the consumer	
There are identifiable mechanisms for consumers to interact with key areas of the institution over important matters (accessible district offices, emergency telephone hotline, bill disputes, service problems)	
There is clear evidence that the institution responds to complains, emergencies and suggestions which consumers make	
There are identifiable, ongoing and effective measures to inform and educate consumers about institutional services and requirements	
The institution makes efforts to invite and encourage an effective level of consumer participation	
There are concerted efforts made to project a positive image of the institution to the consumer	
Efforts are made to ensure accessible services to all levels of the public	
Tariffs and/or charges are designed to be fair and equitable and understandable and affordable and payable for all levels of the public	
Consumers are seen as customers - who pay the bills and thus the salaries	
TOTAL CONSUMER ORIENTATION	
	Total/9
Organisational and Staff Culture	
A observable team spirit exists among the staff	
People express a sense of ownership and pride about working that is expressed in statements such as 'this is a good place to work	
There is a clear commitment to the organisational goals at all levels of the staff; people feel involved in and informed about the institution's activities	
The commitment to personal goals is demonstrated by individual's support for the organisational goals	
Staff are committed to improving their skills and knowledge and attitudes; people are interested in learning new things and new ways of doing things	
Line managers are committed to and involved in the development of their staff	
The organisation provides adequate salaries and incentives to maintain and motivate staff	
Active systems are in place for providing ongoing formal and informal feedback to personnel about job performance	
Individual corruption to the detriment of the organisational team is seen as unacceptable	
A clear system exist for hiring qualified personnel and firing or disciplining staff when necessary	
Staff place a value on maintaining the facilities of the organisation, for example the offices, treatment plants and grounds, signboards, so they look clean, well maintained and attractive	
Staff believe they are trusted in the organisation with responsibility and authority	
TOTAL ORGANISATIONAL AND STAFF CULTURE	
	Total/12

Appendix V

		ASIAKWA											
DATA	**2003**	**2005**	**2005**	**2005**	**2005**	**2006**	**2006**	**2006**	**2006**	**2007**	**2007**	**2007**	**2**
General information			New Ghana Cedis	$ Exchage rate	$ PPP		New Ghana Cedis	$ Exchange rate	$ PPP		New Ghana Cedis	$ Exchange rate	$
Distance from research base (Km)		518				518				518			
Region		Eastern Region				Eastern Region				Eastern Region			
Management model		Community Management				Community Management				Community Management			
Power source		National electricity grid				National electricity grid				National electricity grid			
Year of commencement		2003				2003				2003			
Political													
0													
0													
0													
Institutional and legal framework													
Management model													
0													
0													
Socio-economic and community													
Population		9620				9755				9892			
Population growth rate		2.1				2.1				2.1			
Average household size		3.9				3.9				3.9			
Av. No. of households/house		1.9				1.9				1.9			
No. meetings with customers/year		0				0				2			
Population served by household connections		393				445				563			
Population served by public stand pipes		5700				5700				5700			
Population served by water system		6093				6145				6263			
Percentage of population served by water system		63.33				62.99				63.32			
Operational and technical													
No. of staff on system		7				7				7			
Staff/1000 connections		97.22				89				74			
Staff/1000 people served		1.15				1.14				1.12			
No. of standpost		19				19				19			
No. of household connections		53				60				76			
Hours of flow /day for household connections		24				24				24			
Hours of flow/day for standpipes		8				8				8			
Average hours of flow of water/day		9.0				9.2				9.4			
Average breakdown time (days/year)		15				3				5			
Water production (m3)		21324				21065				23927			
Water distributed/Sold (m3)		19157.48				20098				18685			
Per capita consumption (litres/day)		8.61				8.96				8.17			
Unaccounted for water (%)		10.16				4.59				21.91			
Unaccounted for water (m3/conn/day)		0.08				0.03				0.15			
Connections metered		72				79				95			
Connections metered (%)		100				100				100			
Percentage utilisation of system		21.2				24				30.4			
0													
Financial													
Cost of project (€)	195531.20												
Cost of project (GH¢)	1936057825.48	2473158987.42	247315.90	273142.10	664720.47	2684440977.92	268444.10	293794.97	660075.43	2869973399.33	286997.34	314100.31	
Tariff at stand post /18litre bucket (GH¢)		200	0.02	0.02	0.05	200.00	0.02	0.02	0.05	200.00	0.02	0.02	
Tariff at stand post/m3(GH¢)		11111.11	1.11	1.23	2.99	11111.11	1.11	1.22	2.73	11111.11	1.11	1.19	
Tariff for household connection /m3(GH¢)		11000	1.10	1.21	2.96	11000.00	1.10	1.20	2.70	13000.00	1.30	1.39	
Flat rate charged/ house/month (GH¢)			0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Amount received from District Assembly as loan or grant (GH¢)		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
New connection fee (GH¢)		1000000	100.00	110.44	268.77	1000000.00	100.00	109.44	245.89	1700000.00	170.00	181.63	
Reconnection fee (GH¢)		100000	10.00	11.04	26.88	100000.00	10.00	10.94	24.59	100000.00	10.00	10.68	
Amount billed (GH¢)		268129841	26812.98	29612.96	72066.29	237313380.00	23731.34	25972.44	58352.83	216450500.00	21645.05	23125.39	
Average revenue/year (GH¢)		168921800	16892.18	18656.16	45401.76	168492500.00	16849.25	18440.43	41430.51	214656500.00	21465.65	22933.72	
Average cost of operation /year (GH¢)		110693300	11069.33	12225.26	29751.46	160845900.00	16084.59	17603.56	39550.29	173682800.00	17368.28	18556.12	
Unit operational cost (GH¢/m3)		5778.07	0.58	0.64	1.55	8003.08	0.80	0.88	1.97	9295.31	0.93	0.99	
Unit supply cost (GH¢/m3) (using GWCL depreciation)		12232.88	1.22	1.35	3.29	14681.46	1.47	1.61	3.61	16975.19	1.70	1.81	
Unit supply cost (GH¢/m3) (using CWSA depreciation)		18687.70	1.87	2.06	5.02	21359.84	2.14	2.34	5.25	24655.08	2.47	2.63	
Operating ratio		0.66				0.95				0.81			
Bill collection efficiency		63.00				71.00				99.17			
Accumulated amount in replacement account		123777371.01	12377.74	13670.29	33268.12	114805394.00	11480.54	12564.72	28229.42	164477300.00	16447.73	17572.62	
Investment/person		405919.68	40.59	44.83	109.10	436878.07	43.69	47.81	107.42	458230.89	45.82	48.96	
Revenue/person		27725.14	2.77	3.06	7.45	27421.23	2.74	3.00	6.74	34272.88	3.43	3.66	
Annual depreciation (GWCL 20yr life)	5% annually	123657949.37	12365.79	13657.10	33236.02	134222048.90	13422.20	14689.75	33003.77	143498669.97	14349.87	15331.28	
Annual depreciation (CWSA 10yr life)	10% annually	247315898.74	24731.59	27314.21	66472.05	268444097.79	26844.41	29379.50	66007.54	286997339.93	28699.73	30662.55	
Average tariff/m3		8817.54	0.88	0.97	2.37	8383.55	0.84	0.92	2.06	11488.17	1.15	1.23	

		APAM											
0		2005	2005	2005	2005	2006	2006	2006	2006	2007	2007	2007	2007
DATA			New Ghana Cedis	$ Exchange rate	$ PPP		New Ghana Cedis	$ Exchange rate	$ PPP		New Ghana Cedis	$ Exchange rate	$ PPP
General information													
Distance from research base (Km)													
Region													
Management model													
Power source													
Year of commencement	2004												
0													
0													
Political													
0													
0													
Institutional and legal framework													
Management model	GWCL												
0													
0													
Socio-economic and community													
Population		34967				35422				35882			
Population growth rate		1.3				1.3				1.3			
Average household size		4.3				4.3				4.3			
Av. No. of households/house		2.6				2.6				2.6			
No. meetings with customers/year		0				0				0			
Population served by household connections		7938				8161				8765			
Population served by public stand pipes		11100				11400				13800			
Population served by water system		19038				19561				22565			
Percentage of population served by water system		54.4				55.2				62.9			
Operational and technical													
No. of staff on system		6				5				5			
Staff/1000 connections		7.5				6.0				5.5			
No. of standpost		37				38				46			
No. of household connections		710				730				784			
Commercial connections		5				8				15			
Government Institutions connections		18				20				20			
Private Institutions connections		30				32				40			
Industrial Connections		2				2				3			
Average hours of flow of water/day		16				16				16			
Average breakdown time (days/year)		60				90				45			
Water production (m3)		100914				164328				425688			
Water distributed/Sold (m3)		84992				55128				160446			
Per capita consumption (litres/day)		12.23				7.72				19.48			
Unaccounted for water (%)		15.8				66.5				62.31			
Unaccounted for water (m3/conn/day)		0.05				0.36				0.80			
Connections metered		165				162				246			
Connections metered (%)		22.1				21.1				29.6			
Financial													
Cost of project ($)	6000000												
Cost of project (GH cedis)	53724495000	61843877929.35	6184387.793	6830198.42	16622017.40	67706832068.70	6770683.21	7410081.54	16648388.58	72855250424.55	7285525.04	7783793.56	16316673.03
Tariff at stand post /18litre bucket (GH¢)		72.56	0.007	0.008	0.02	72.56	0.007	0.008	0.018	72.56	0.007	0.008	0.016
Tariff at stand post/m3(GH¢)		4031	0.40	0.45	1.08	4031	0.40	0.44	0.99	4031	0.40	0.43	0.90
Tariff for household connection /m3(GH¢)		7000	0.70	0.77	1.88	7000	0.70	0.77	1.72	10000	1.00	1.07	2.24
Flat rate charged/ house/month (GH¢)		80620	8.06	8.90	21.67	80620	8.06	8.82	19.82	132000	13.20	14.10	29.56
New connection fee (GH¢)		325000	32.50	35.89	87.35	325000	32.50	35.57	79.91	325000	32.50	34.72	72.79
Reconnection fee (GH¢)		60400	6.04	6.67	16.23	60400	6.04	6.61	14.85	60400	6.04	6.45	13.53
Amount billed (GH¢)		619457050	61945.71	68414.44	166493.86	548177004	54817.70	59994.48	134790.88	1401704000	140170.40	149756.87	313925.84
Average revenue/year (GH¢)		383079015	38307.90	42308.24	102961.62	294832231	29483.22	32267.51	72496.10	744531000	74453.10	79545.06	166745.28
Average cost of operation /year (GH¢)		484387200	48438.72	53496.98	130190.61	353305200	35330.52	38667.00	86873.98	523596240	52359.62	55940.58	117264.69
Unit operational cost (GH¢/m3)		5699.21	0.57	0.63	1.53	6408.82	0.64	0.70	1.58	3263.38	0.33	0.35	0.73
Unit supply cost (GH¢/m3) (using GWCL depreciation)		42081.39	4.21	4.65	11.31	67817.57	6.78	7.42	16.68	25967.36	2.60	2.77	5.82
Unit supply cost (GH¢/m3) (using CWSA depreciation)		78463.56	7.85	8.67	21.09	129226.32	12.92	14.14	31.78	48671.34	4.87	5.20	10.90
Operating ratio		1.26				1.20				0.70			
Bill collection effeciency		61.84				53.78				53.12			
Investment/person		3248478.18	324.85	358.77	873.11	3461246.74	346.12	378.81	851.08	3228666.65	322.87	344.95	723.09
Revenue/person		20122.02	2.01	2.22	5.41	15072.14	1.51	1.65	3.71	32994.77	3.30	3.53	7.39
Annual depreciation (GWCL 20yr life)	5% annually	3092193896.47	309219.39	341509.92	831100.87	3385341603.44	338534.16	370504.08	832419.43	3642762521.23	364276.25	389189.68	815833.65
Annual depreciation (CWSA 10yr life)	10% annually	6184387792.94	618438.78	683019.84	1662201.74	6770683206.87	677068.32	741008.15	1664838.86	7285525042.46	728552.50	778379.36	1631667.30
Average tariff		4507.24	0.45	0.50	1.21	5348.14	0.53	0.59	1.32	4640.38	0.46	0.50	1.04

		ATEBUBU											
DATA	2002	2005	2005	2005	2005	2006	2006	2006	2006	2007	2007	2007	2007
General information			**New Ghana Cedis**	**$ Exchange rate**	**$ PPP**		**New Ghana Cedis**	**$ Exchange rate**	**$ PPP**		**New Ghana Cedis**	**$ Exchange rate**	**$ PPP**
Distance from research base (Km)		501				501				501			
Region		Brong Ahafo				Brong Ahafo				Brong Ahafo			
Management model		Private operator (Armco Ltd)				Private operator (Armco Ltd)				Private operator (Armco Ltd)			
Power source		Diesel Generator				Diesel Generator				Diesel Generator			
Year of commencement		2002				2002				2002			
0													
0													
Political													
0													
0													
0													
Institutional and legal framework													
Management model										Private			
0													
0													
Socio-economic and community													
Population		26,442				27,642				28,896			
Population growth rate		2.5				4.5				4.5			
Average household size		4.6				4.6				4.6			
Av. No. of households/house		2				2				2			
No. meetings with customers/year		0				0				0			
Population served by household connections		1481				1702				2125			
Population served by public stand pipes		9900				9900				9900			
Population served by water system		11381				11602				12025			
Percentage of population served by water system		43.04				41.97				41.62			
Operational and technical													
No. of staff on system		13				14				14			
Staff/1000 connections		61.61				58.09				46.51			
Staff/1000 persons served		1.14				1.21				1.16			
No. of standpost		33				33				33			
No. of household connections		161				185				231			
Commercial connections		0				0				2			
Government Institutions connections		7				7				10			
Private Institutions connections		10				16				25			
Industrial Connections		0				0				0			
Average hours of flow of water/day		7				8				2			
Average breakdown time (days/year)		60				135				90			
Water production (m3)		81244				84572				99921			
Water distributed/sold (m3)		67287				60612				66507.5			
Per capita consumption (litres/day)		16.20				14.31				15.15			
Unaccounted for water (%)		17.2				28.33				33.4			
Unaccounted for water (m3/conn/day)		0.18				0.27				0.30			
Connections metered		211				241				301			
Connections metered (%)		100				100				100.0			
0													
Financial													
Cost of project (GH¢)	1000000000	1544190000.00	154419.00	170544.35	415037.90	1653320000.00	165332.00	180945.34	406533.77	1749150000	174915.00	186877.71	391739.90
Tariff at stand post /18litre bucket (GH¢)		200.00	0.02	0.02	0.05	300	0.03	0.03	0.07	300	0.03	0.03	0.07
Tariff at stand post/m3(GH¢)		11111.11	1.11	1.23	2.99	16666.67	1.67	1.82	4.10	16666.67	1.67	1.78	3.73
Tariff for household connection /m3(GH¢)		9000.00	0.90	0.99	2.42	11000	1.10	1.20	2.70	15000	1.50	1.60	3.36
Flat rate charged/ house/month (GH¢)		0.00	0.00	0.00	0.00	50000	5.00	5.47	12.29	50000	5.00	5.34	11.20
Amount received from District Assembly as loan or grant (GH¢)		40000.00	4.00	4.42	10.75	0	0.00	0.00	0.00	0	0.00	0.00	0.00
New connection fee (GH¢)		900000.00	90.00	99.40	241.90	900000	90.00	98.50	221.30	900000	90.00	96.16	201.56
Reconnection fee (GH¢)		50000.00	5.00	5.52	13.44	50000	5.00	5.47	12.29	0	0.00	0.00	0.00
Amount billed (GH¢)		761118274.00	76111.83	84059.88	204568.69	723871400	72387.14	79223.11	177992.26	883995800	88399.58	94445.37	197979.83
Average revenue/year (GH¢)		549733523.00	54973.35	60714.00	147754.00	553811800	55381.18	60611.17	136176.42	657421500	65742.15	70238.36	147236.22
Average cost of operation /year (GH¢)		674699167.00	67469.92	74515.53	181341.50	907494826	90749.48	99319.53	223143.31	964939585	96493.96	103093.33	216108.02
Unit operational cost (GH¢/m3)		10027.18	1.00	1.11	2.70	14972.20	1.50	1.64	3.68	14508.73	1.45	1.55	3.25
Unit supply cost (GH¢/m3) (using GWCL depreciation)		11174.65	1.12	1.23	3.00	16336.05	1.63	1.79	4.02	15823.74	1.58	1.69	3.54
Unit supply cost (GH¢/m3) (using CWSA depreciation)		12322.12	1.23	1.36	3.31	17699.91	1.77	1.94	4.35	17138.74	1.71	1.83	3.84
Operating ratio		1.23				1.64				1.47			
Bill collection efficiency		72.23				76.51				74.37			
Accumulated amount in replacement account		59000000.00	5900.00	6516.11	15857.66	59000000.00	5900.00	6457.17	14507.47	59000000.00	5900	6303.51	13213.65
Investment/person		135679.01	13.57	14.98	36.47	142503.02	14.25	15.60	35.04	145457.04	14.55	15.54	32.58
Revenue/person		59281.90	5.93	6.55	15.93	47734.17	4.77	5.22	11.74	54670.32	5.47	5.84	12.24
Annual depreciation (GWCL 20yr life)	5% annually	77209500.00	7720.95	8527.22	20751.89	82666000.00	8266.60	9047.27	20326.69	87457500.00	8745.75	9343.89	19587.00
Annual depreciation (CWSA 10yr life)	10% annually	154419000.00	15441.90	17054.44	41503.79	165332000.00	16533.20	18094.53	40653.38	174915000.00	17491.50	18687.77	39173.99
Average tariff/m3		8169.98	0.82	0.90	2.20	9137.00	0.91	1.00	2.25	9884.92	0.99	1.06	2.21

		BEKWAI											
DATA	**1998**	**2005**	**2005**	**2005**	**2005**	**2006**	**2006**	**2006**	**2006**	**2007**	**2007**	**2007**	**2007**
General information			**New Ghana Cedis**	**$ Exchange rate**	**$ PPP**		**New Ghana Cedis**	**$ Exchange rate**	**$ PPP**		**New Ghana Cedis**	**$ Exchange rate**	**$ PPP**
Distance from research base (Km)		426				426				426			
Region		Ashanti Region				Ashanti Region				Ashanti Region			
Management model		Private operator (Vicco Ventures)				Private operator (Vicco Venture)				Private operator (Vicco Venture)			
Power source		National Electricity grid				National Electricity grid				National Electricity grid			
Year of commencement		2002				2002				2002			
0													
0													
Political													
0													
0													
0													
Institutional and legal framework													
Management model										Private operations			
0													
0													
Socio-economic and community													
Population		23,743				24,466				25,210			
Population growth rate		3				3				3			
Average household size		5				5				5			
Av. No. of households/house		2.9				2.9				2.9			
No. meetings with customers/year		2				1				0			
Population served by household connections		4640				5278				6148			
Population served by public stand pipes		12000				12000				12000			
Population served by water system		16640				17278				18148			
Percentage of population served by water system		70.08				70.62				71.99			
Operational and technical													
No. of staff on system		10				10				10			
Staff/1000 connections		27.78				24.75				21.55			
Staff/1000 persons served		0.60				0.58				0.55			
No. of standpost		40				40				40			
No. of household connections		320				364				424			
Average hours of flow of water/day		12.5				12.9				13.4			
Average hours of flow of water/day for standpipes		8				8				8			
Average hours of flow of water /day for household connections		24				24				24			
Average breakdown time (days/year)		6				9				6			
Water production (m3)		184248.89				234228.75				197059.86			
Water distributed/sold (m^3)		143305.76				137350.77				145918.54			
Per capita consumption (litres/day)		23.59				21.78				22.03			
Unaccounted for water (%)		22.2				41.4				26.0			
Unaccounted for water (m3/conn/day)		0.31				0.66				0.30			
Connections metered		360				404				465			
Connections metered (%)		100				100				100.2155172			
Financial													
Cost of project (GH¢)	1450182200	3476623300.81	347662.33	383967.30	934425.44	3634881684.30	363488.17	397814.65	893778.68	3773852644.53	377385.26	403195.24	845192.62
Tariff at stand post /18litre bucket (GH¢)		100	0.01	0.01	0.03	150	0.02	0.02	0.04	150.00	0.02	0.02	0.03
Tariff at stand post/m3(GH¢)		5555.56	0.56	0.61	1.49	8333.33	0.83	0.91	2.05	8333.33	0.83	0.89	1.87
Tariff for household connection /m3(GH¢)		5500	0.55	0.61	1.48	7150	0.72	0.78	1.76	7150.00	0.72	0.76	1.60
Flat rate charged/ house/month (GH¢)		0	0.00	0.00	0.00	0	0.00	0.00	0.00	N/A	N/A	N/A	N/A
Amount received from District Assembly as loan or grant (GH¢)		0	0.00	0.00	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
New connection fee (GH¢)		750000	75.00	82.83	201.58	750000	75.00	82.08	184.42	750000.00	75.00	80.13	167.97
Reconnection fee (GH¢)		50000	5.00	5.52	13.44	50000	5.00	5.47	12.29	50000.00	5.00	5.34	11.20
Amount billed (GH¢)		945973200	94597.32	104475.74	254252.86	946813200	94681.32	103622.67	232811.28	1201468700.00	120146.87	128363.90	269081.11
Average revenue/year (GH¢)		891441900	89144.19	98453.16	239596.27	846409965	84641.00	92634.18	208123.19	1039400000.00	103940.00	111048.62	232784.18
Average cost of operation /year (GH¢)		665726550	66572.66	73524.57	178929.89	648899262	64889.93	71017.89	159557.41	950010000.00	95001.00	101498.27	212764.38
Unit operational cost (GH¢/m3)		4645.50	0.46	0.51	1.25	4724.39	0.47	0.52	1.16	6510.55	0.65	0.70	1.46
Unit supply cost (GH¢/m3) (using GWCL depreciation)		5858.51	0.59	0.65	1.57	6047.61	0.60	0.66	1.49	7803.69	0.78	0.83	1.75
Unit supply cost (GH¢/m3) (using CWSA depreciation)		7071.52	0.71	0.78	1.90	7370.82	0.74	0.81	1.81	9096.82	0.91	0.97	2.04
Operating ratio		0.75				0.77				0.91			
Bill collection efficiency		94.24				89.40				86.51			
Accumulated amount in replacement account		348310200.00	34831.02	38468.28	93616.67	471862150.00	47186.22	51642.31	116025.87	579812150.00	57981.22	61946.64	129854.82
Investment/person		208931.69	20.89	23.07	56.16	210376.2984	21.04	23.02	51.73	207948.68	20.79	22.22	46.57
Revenue/person		53572.23	5.36	5.92	14.40	48987.73	4.90	5.36	12.05	57273.53	5.73	6.12	12.83
Annual depreciation (GWCL 20yr life)	5% annually	173831165.04	17383.12	19198.37	46721.27	181744084.22	18174.41	19890.73	44688.93	188692632.23	18869.26	20159.76	42259.63
Annual depreciation (CWSA 10 yr life)	10% annually	347662330.08	34766.23	38396.73	93442.54	363488168.43	36348.82	39781.46	89377.87	377385264.45	37738.53	40319.52	84519.26
Average tariff/m3		6220.56	0.62	0.69	1.67	6162.40	0.62	0.67	1.52	7123.15	0.71	0.76	1.60

		BOLE											
DATA	**1996**	**2005**	**2005**	**2005**	**2005**	**2006**	**2006**	**2006**	**2006**	**2007**	**2007**	**2007**	**2007**
General information			**New Ghana Cedis**	**$ Exchange rate**	**$ PPP**		**New Ghana Cedis**	**$ Exchange rate**	**$ PPP**		**New Ghana Cedis**	**$ Exchange rate**	**$ PPP**
Distance from research base (Km)		220				220				220			
Region		Northern Region				Northern Region				Northern Region			
Management model		Community management				Community management				Community management			
Power source		National Electricity grid				National Electricity grid				National Electricity grid			
Year of commencement		1996				1996				1996			
Political													
0													
0													
0													
Institutional and legal framework													
Management model													
0													
0													
Socio-economic and community													
Population		10,445				10,696				10,954			
Population growth rate		2.4				2.4				2.4			
Average household size		5.2				5.2				5.2			
Av. No. of households/house		1.6				1.6				1.6			
No. meetings with customers/year		0				1				0			
Population served by household connections		1572				1847				2188			
Population served by public stand pipes		9000				9000				9000			
Population served by water system		10572				10847				11188			
Percentage of population served by water system		101.22				101.41				102.14			
Operational and technical													
No. of staff on system		8				8				8			
Staff/1000 connections		34				28				24			
Staff/1000 people served		0.76				0.74				0.72			
No. of standpost		30				30				30			
No. of household connections		189				222				263			
Commercial connections		0				0				1			
Government Institutions connections		15				15				16			
Private Institutions connections		16				20				20			
Industrial Connections		0				0				0			
Average hours of flow of water/day		1.67				1.67				2.67			
Average breakdown time (days/year)		0.3				36				60			
Water production (m3)		49226				51435				50508			
Water distributed/Sold (m3)		39856				40036				38965			
Per capita consumption (litres/day)		10.33				10.11				9.54			
Unaccounted for water (%)		19				22.16				23			
Unaccounted for water (m3/conn/day)		0.10				0.11				0.10			
Connections metered		107				137				239			
Connections metered (%)		42.8				47.7				72.4			
Financial													
Cost of project at commencement (CD$)	491574												
Cost of project (GH¢)	584888673.13	1659855565.48	165985.56	183318.76	446125.78	1723684466.37	172368.45	188646.29	423835.64	1779734347.92	177973.4348	190145.32	398589.58
Tariff at stand post /18litre bucket (GH¢)		300	0.03	0.03	0.08	300	0.03	0.03	0.07	300.00	0.03	0.03	0.067
Tariff at stand post/m3(GH¢)		16666.67	1.67	1.84	4.48	16666.67	1.67	1.82	4.10	16666.67	1.67	1.78	3.733
Tariff for household connection /m3(GH¢)		3600	0.36	0.40	0.97	3600	0.36	0.39	0.89	4000.00	0.40	0.43	0.90
Flat rate charged/ house/month (GH¢)		20000	2.00	2.21	5.38	40000	4.00	4.38	9.84	40000.00	4.00	4.27	8.96
Amount received from District Assembly as loan or grant (GH¢)		0.00	0.00	0.00	0.00	67000000	6700.00	7332.72	16474.59	0.00	0.00	0.00	0.00
New connection fee (GH¢)		230000	23.00	25.40	61.82	230000	23.00	25.17	56.55	230000.00	23.00	24.57	51.51
Reconnection fee (GH¢)		50000	5.00	5.52	13.44	50000	5.00	5.47	12.29	50000.00	5.00	5.34	11.20
Amount billed (GH¢)		80551600	8055.16	8896.33	21650.16	103999500	10399.95	11382.08	25572.37	164014245.00	16401.42	17523.14	36732.66
Average revenue/year (GH¢)		79865532	7986.55	8820.56	21465.77	60187700	6018.77	6587.16	14799.51	106370023.00	10637.00	11364.48	23822.65
Average cost of operation /year (GH¢)		93613600	9361.36	10338.93	25160.89	98067610	9806.76	10732.88	24113.78	239928043.00	23992.80	25633.71	53734.32
Unit operational cost (GH¢/m3)		2348.80	0.23	0.26	0.63	2449.49	0.24	0.27	0.60	6157.53	0.62	0.66	1.38
Unit supply cost (GH¢/m3) (using GWCL depreciation)		4431.11	0.44	0.49	1.19	4602.15	0.46	0.50	1.13	8441.29	0.84	0.90	1.89
Unit supply cost (GH¢/m3) (using CWSA depreciation)		6513.43	0.65	0.72	1.75	6754.82	0.68	0.74	1.66	10725.05	1.07	1.15	2.40
Operating ratio		1.17				1.63				2.26			
Bill collection efficiency		99.15				57.87				64.85			
Investment/person		156997.75	15.70	17.34	42.20	158908.28	15.89	17.39	39.07	159073.02	15.91	17.00	35.63
Revenue/person		7554.10	0.76	0.83	2.03	5548.77	0.55	0.61	1.36	21444.82	2.14	2.29	4.80
Annual depreciation (GWCL 20yr life)	5% annually	82992778.27	8299.28	9165.94	22306.29	86184223.32	8618.42	9432.31	21191.78	88986717.40	8898.67	9507.27	19929.48
Annual depreciation (CWSA 10yr life)	10% annually	165985556.55	16598.56	18331.88	44612.58	172368446.64	17236.84	18864.63	42383.56	177973434.79	17797.34	19014.53	39858.96
Average tariff		2003.85	0.20	0.22	0.54	1503.34	0.15	0.16	0.37	6157.53	0.62	0.66	1.38

	DAMONGO											
DATA	**2005**	**2005**	**2005**	**2005**	**2006**	**2006**	**2006**	**2006**	**2007**	**2007**	**2007**	**2007**
General information		**New Ghana Cedis**	**$ Exchange rate**	**$ PPP**		**New Ghana Cedis**	**$ Exchange rate**	**$ PPP**		**New Ghana Cedis**	**$ Exchange rate**	**$ PPP**
Distance from research base (Km)	122				122							
Region	Northern				Northern							
Management model	Public Utility/DA				Public Utility/DA							
Power source	National Electricity grid				National Electricity grid							
Year of commencement	2004				2004							
Political												
Institutional and legal framework												
Management model												
Socio-economic and community												
Population	15,270				15,406				15,544			
Population growth rate	0.9				0.9				0.9			
Average household size	5.9				5.9				5.9			
Av. No. of households/house	1.3				1.3				1.3			
No. meetings with customers/year	0				0				0			
Population served by household connections	0				0				0			
Population served by public stand pipes	7200				14400				14400			
Population served by water system	7200				14400				14400			
Percentage of population served by water system	47.15				93.47				92.64			
Operational and technical												
No. of staff on system	4				4				4			
Staff/1000 connections	167				83				83			
No. of standpost	24				48				48			
No. of household connections	0				0				0			
Average hours of flow of water/day	10				10				10			
Average breakdown time (days/year)	3				0				35			
Water production (m3)	19440				38880				38880			
Amount of water sold using the estimated 10% ufw (m^3)	17496				34992				34992			
Per capita consumption (litres/day)	6.7				6.7				6.7			
Unaccounted for water (%)	10				10				10			
Unaccounted for water (m3/conn/day)												
Connections metered	24				48				48			
Connections metered (%)	100				100				100			
Financial												
Cost of project (GH¢)	150678892.13	15067.89	16641.37	40498.55	3971241892.13	397124.19	434627.13	976486.07	4351806003	435180.60	464943.29	974631.14
Cost of project ($)	28446.48										0.00	0.00
Tariff at stand post /18litre bucket (GH¢)	150	0.02	0.02	0.04	150	0.02			150	0.02	0.02	0.03
Tariff at stand post/m3(GH¢)	8333.33	0.83	0.92	2.24	8333.33	0.83			8333.33	0.83	0.89	1.87
Tariff for household connection /m3(GH¢)	N/A				N/A				N/A	N/A	N/A	N/A
Flat rate charged/ house/month (GH¢)	N/A				N/A				N/A	N/A	N/A	N/A
Amount received from District Assembly as loan or grant (GH¢)	0.00				0.00				0	0.00	0.00	0.00
New connection fee (GH¢)	N/A				N/A				N/A	N/A	N/A	N/A
Reconnection fee (GH¢)	N/A				N/A				N/A	N/A	N/A	N/A
Amount billed (GH¢)	0				0					0.00	0.00	0.00
Average revenue/year (GH¢)	8083200	808.32	892.73	1987.57	83917500	8391.75	9184.24	20634.42	44440000	4444.00	4747.93	9952.79
Average cost of operation /year (GH¢)	4757500	475.75	525.43	1278.69	20476000	2047.60	2240.97	5034.83	32440000	3244.00	3465.86	7265.27
Unit operational cost (GH¢/m3)	271.92	0.03	0.03	0.07	585.16	0.06	0.06	0.14	927.07	0.09	0.10	0.21
Unit supply cost (GH¢/m3) (using GWCL depreciation)	702.53	0.07	0.08	0.19	6259.66	0.63	0.69	1.54	7145.36	0.71	0.76	1.60
Unit supply cost (GH¢/m3) (using CWSA depreciation)	1133.14	0.11	0.13	0.30	11934.16	1.19	1.31	2.93	13363.64313	1.34	1.43	2.99
Operating ratio	0.59				0.24				0.73			
Bill collection efficiency	N/A				N/A				N/A			
Investment/person	20927.62	2.09	2.31	5.62	275780.69	27.58	30.18	67.81	302208.75	30.22	32.29	67.68
Revenue/person	1122.67	0.11	0.12	0.30	5827.60	0.58	0.64	1.43	3086.11	0.31	0.33	0.69
Annual depreciation (GWCL 20yr life)	7533944.61	753.39	832.07	2024.93	198562094.61	19856.21	21731.36	48824.30	217590300.13	21759.03	23247.16	48731.56
Annual depreciation (CWSA 10yr life)	15067889.21	1506.79	1664.14	4049.85	397124189.21	39712.42	43462.71	97648.61	435180600.26	43518.06	46494.33	97463.11
Average tariff/m3	462.00	0.05	0.05	0.12	2398.19	0.24	0.26	0.59	1270.00	0.13	0.14	0.28

		SALAGA											
DATA		2005	2005	2005	2005	2006	2006	2006	2006	2007	2007	2007	2007
General information			New Ghana Cedis	$ Exchange rate	$ PPP		New Ghana Cedis	$ Exchange rate	$ PPP		New Ghana Cedis	$ Exchange rate	$ PPP
Distance from research base (Km)		116				116							
Region		Northern Region				Northern Region							
Management model		Community management				Community management							
Power source		National Electricity grid				National Electricity grid							
Year of commencement	2000	2000				2000							
Political													
Institutional and legal framework													
Management model													
Socio-economic and community													
Population		18,606				19,022				19,448	2.239512144		
Population growth rate		2.2				2.2				2.2			
Average household size		6				6				6			
Av. No. of households/house		1.9				1.9				1.9			
No. meetings with customers/year		0				0				0			
Population served by household connections		3762				4970				6304.2			
Population served by public stand pipes		4800				0				0			
Population served by water system		8562				4970				6304.2			
Percentage of population served by water system		46.02				26.13				32.42			
Operational and technical													
No. of staff on system		7				7				8			
Staff/1000 connections		18				15				13			
Staff/1000 people served		0.82				1.41				1.27			
No. of standpost		16				0				0			
No. of household connections		330				436				553			
Commercial connections		0				0				1			
Government Institutions connections		20				20				22			
Private Institutions connections		15				20				25			
Industrial Connections		0				0				0			
Average hours of flow of water/day		0.7				0.4				1.7			
Average breakdown time (days/year)		60				150				30			
Water production (m3)		61542.0				49234				53357			
Water sold (m3)		43079.4				24617				31456			
Unaccounted for water (%)		30				50				41.05			
Per capita consumption (litres/day)		13.78				13.57				13.67			
Unaccounted for water (m3/conn/day)		0.13				0.14				0.10			
Connections metered		0				0				0			
Connections metered (%)													
Financial													
Cost of project (GH¢)	3620632369	7318746271	731874.63	808301.34	1967087.64	7713865881	771386.59	844233.49	1896757.43	8060831081	806083.1081	861212.40	1805304.96
Cost of project at commencement (C.D$)	670736.00	670736.00											
Tariff at stand post /18litre bucket (GH¢)		200	0.020	0.02	0.05	N/A	N/A			N/A	N/A	N/A	N/A
Tariff at stand post/m3(GH¢)		11111.11	1.11	1.23	2.99	N/A	N/A			N/A	N/A	N/A	N/A
Tariff for household connection /m3(GH¢)		2222.22	0.22	0.25	0.60	2222.22	0.22	0.24	0.55	13333	1.33	1.42	2.99
Flat rate charged/ house/month (GH¢)		5000/whole time of flow	0.50/whole time of flow			5000/whole time of flow	0.50/whole time of flow			30000/whole time of flow			
Amount received from District Assembly as loan or grant (GH¢)		16000000	1600.00	1767.08	4300.38	67000000	6700.00	7332.72	16474.59	45622000	4562.2	4874.22	10217.51
New connection fee (GH¢)		500000	50.00	55.22	134.39	500000	50.00	54.72	122.94	6000000	600	641.03	1343.76
Reconnection fee (GH¢)		50000	5.00	5.52	13.44	50000	5.00	5.47	12.29	0	0	0.00	0.00
Amount billed (GH¢)		63755333			17135.77	38417647	3841.76	4204.57		26810000	2681	2864.36	6004.37
Average revenue/year (GH¢)		47809000	4780.90	5280.15	12849.81	32400000	3240.00	3545.97	7966.81	21821000	2182.1	2331.34	4887.03
Average cost of operation /year (GH¢)		127445660	12744.57	14075.43	34254.06	159669900	15966.99	17474.85	39261.13	42350000	4235	4524.64	9484.71
Unit operational cost (GH¢/m3)		2958.39	0.30	0.33	0.80	6486.16	0.65	0.71	1.59	1346.33	0.13	0.14	0.30
Unit supply cost (GH¢/m3) (using GWCL depreciation)		11452.87	1.15	1.26	3.08	22153.93	2.22	2.42	5.45	14159.19	1.42	1.51	3.17
Unit supply cost (GH¢/m3) (using CWSA depreciation)		19947.36	1.99	2.20	5.36	37821.69	3.78	4.14	9.30	26972.06	2.70	2.88	6.04
Operating ratio		2.67				4.93				1.9			
Bill collection efficiency		75				84				81.4			
Investment/person		854794.00	85.48	94.41	229.75	1551960.78	155.20	169.85	381.61	1278644.57	127.86	136.61	286.37
Revenue/person		5583.86	0.56	0.62	1.50	6518.59	0.65	0.71	1.60	3461.34	0.35	0.37	0.78
Annual depreciation (GWCL 20yr life)	5% annually	365937313.54	36593.73	40415.07	98354.38	385693294.06	38569.33	42211.67	94837.87	403041554.06	40304.16	43060.62	90265.25
Annual depreciation (CWSA 10yr life)	10% annually	731874627.08	73187.46	80830.13	196708.76	771386588.12	77138.66	84423.35	189675.74	806083108.12	80608.31	86121.24	180530.50
Average tariff/m3		1109.79	0.11	0.12	0.30	1316.16	0.13	0.14	0.32	693.70	0.07	0.07	0.16

	SOGAKOPE	2005	2005	2005	2005	2006	2006	2006	2006	2007	2007	2007	20
DATA			New Ghana Cedis	$ Exchange rate	$ PPP		New Ghana Cedis	$ Exchange rate	$ PPP		New Ghana Cedis	$ Exchange rate	$ P
General information													
Distance from research base (Km)													
Region													
Management model													
Power source													
Year of commencement	1998												
Political													
Institutional and legal framework													
Management model	GWCL												
Socio-economic and community													
Population		46600				48184				49823			
Population growth rate		3.4				3.4				3.4			
Average household size		4				4				4			
Av. No. of households/house		2.1				2.1				2.1			
No. meetings with customers/year		0				0				0			
Population served by household connections		7199				7325				7300			
Population served by public stand pipes		44100				44700				48900			
Population served by water system		51299				52025				56200			
Percentage of population served by water system		110.1				108.0				112.8			
Operational and technical													
No. of staff on system		8				10				10			
Staff/1000 connections		7.4				9.0				8.8			
No. of standpost		147				149				163			
No. of household connections		857				872				869			
Commercial connections		30				38				45			
Government Institutions connections		26				26				30			
Private Institutions connections		5				6				7			
Industrial Connections		13				14				16			
Average hours of flow of water/day for household conn		18				18				20			
Average hours of flow of water/day for standpipes		10				10				10			
Average hours of flow of water/day		11.1				11.1				11.3			
Average breakdown time (days/year)		10				15				20			
Water production (m3)		426084				433428				698196			
Water distributed/Sold (m3)		262968				336180				512544			
Per capita consumption (litres/day)		14.04				17.70				24.99			
Unaccounted for water (%)		38.3				22.4				26.59			
Unaccounted for water (m3/conn/day)		0.41				0.24				0.45			
Connections metered		830				1051				1097			
Connections metered (%)		77.0				95.1				97.1			
Financial													
Cost of project (GH¢)	37993373333.33	91084173428.13	9108417.343	10059572.56	24481044.30	95230390260.00	9523039.03	10422359.69	23416138.27	98871295226.53	9887129.52	10563325.86	
Tariff at stand post /18litre bucket (GH¢)		79.20	0.008	0.009	0.021	79.20	0.008	0.009	0.019	122.40	0.012	0.013	
Tariff at stand post/m3(GH¢)		4400	0.44	0.49	1.18	4400	0.44	0.48	1.08	6800	0.68	0.73	
Tariff for household connection /m3(GH¢)		4300	0.43	0.47	1.16	4300	0.43	0.47	1.06	6600	0.66	0.71	
Flat rate charged/ house/month (GH¢)		64500	6.45	7.12	17.34	64500	6.45	7.06	15.86	99000	9.90	10.58	
New connection fee (GH¢)		1000000	100.00	110.44	268.77	1500000	150.00	164.17	368.83	2000000	200.00	213.68	
Reconnection fee (GH¢)		30000	3.00	3.31	8.06	30000	3.00	3.28	7.38	30000	3.00	3.21	
Amount billed (GH¢)		1889011200	188901.12	208627.30	507716.82	2123071200	212307.12	232356.62	522040.59	3552306000	355230.60	379525.38	
Average revenue/year (GH¢)		1515333600	151533.36	167357.38	407282.05	1636459200	163645.92	179100.04	402387.88	2849970000	284997.00	304488.39	
Average cost of operation /year (GH¢)		3338109600	333810.96	368669.49	897196.58	5384503200	538450.32	589299.58	1323991.96	5818789200	581878.92	621674.53	
Unit operational cost (GH¢/m3)		12693.98	1.27	1.40	3.41	16016.73	1.60	1.75	3.94	11352.76	1.14	1.21	
Unit supply cost (GH¢/m3) (using GWCL depreciation)		30012.47	3.00	3.31	8.07	30180.33	3.02	3.30	7.42	20997.91	2.10	2.24	
Unit supply cost (GH¢/m3) (using CWSA depreciation)		47330.96	4.73	5.23	12.72	44343.93	4.43	4.85	10.90	30643.06	3.06	3.27	
Operating ratio		2.20				3.29				2.04			
Bill collection effeciency		80.22				77.08				80.23			
Revenue/person		29539.36	2.95	3.26	7.94	31455.37	3.15	3.44	7.73	50711.57	5.07	5.42	
Investment/person		1775561.48	177.56	196.10	477.22	1830480.66	183.05	200.33	450.10	1759288.24	175.93	187.96	
Annual depreciation (GWCL 20yr life)	5% annually	4554208671.41	455420.87	502978.63	1224052.22	4761519513.00	476151.95	521117.98	1170806.91	4943564761.33	494356.48	528166.29	
Annual depreciation (CWSA 10yr life)	10% annually	9108417342.81	910841.73	1005957.26	2448104.43	9523039026.00	952303.90	1042235.97	2341613.83	9887129522.65	988712.95	1056332.59	
Average tariff		5762.43	0.58	0.64	1.55	4867.81	0.49	0.53	1.20	5560.44	0.56	0.59	

Appendix VI

APAM Sources of water		Expenditure on water /month			Distances to sources (K		Water consumption			Time spent looking for water	Large storage facilities			Satisfaction						WTP more	Household characteristic		Expenditure on other utilitie		Household income/annum	
Rainy season	Dry season	Rainy season	Dry season	Average	Main	Alternative	Quantity(lit)/day	lit/person/day	Is it enough?	Time (minutes)	Yes or No	Size (m^3)	Time to empty it(days	Water quality	Hours of flow	Water pressure	Complaints handling	Queues	Water tariff		Size	No./house	Electricity/mth	Telephone/mth	Income	Per capita income
5	5	0	0	0	0	0.5	360	40.00	1	2	2	0	0	2	4	3	5	3	2	1	9	2	31	100	7800	866.67
1	5	5	7	6	0	0.85	180	22.50	1	2	2	0	0	1	2	4	2	5	2	1	8	5	15	100	9000	1125.00
1	5	7.5	5	6.25	0	0.3	144	9.00	1	2	2	0	0	3	5	4	4	6	4	1	16	2	50	84	23840	1490.00
5	5	0	0	0	0	0.4	252	31.50	1	2	2	0	0	3	5	5	4	6	2	1	8	2	92	65	6945	868.13
5	4	0	16	8	0.05	1.3	90	22.50	1	5	2	0	0	3	5	4	1	4	4	1	4	2	15	12	2430	607.50
1	1	9	9	9	0	0.7	252	28.00	1	2	1	54	30	2	3	4	4	6	4	2	9	1	30	20	10449	1161.00
1	1	6	6	6	0	0.06	360	45.00	1	3	2	0	0	5	5	4	1	3	1	1	8	2	30	40	5200	650.00
1	1	10	15	12.5	0	1	180	36.00	2	2	2	0	0	4	2	2	4	2	4	1	5	5	27	20	2604	520.80
9	5	0	0	0	0.02	0.7	120	30.00	1	20	2	0	0	2	3	4	6	3	5	2	4	4	2.5	2	260	65.00
4	4	5	8	6.5	0.05	0.5	198	39.60	2	20	2	0	0	3	4	4	5	3	4	1	5	2	12	14	2920	584.00
3	3	6	42	24	0.015	2	50	12.50	1	25	2	0	0	2	3	4	6	5	6	1	4	2	37.2	18	560	140.00
1	1	18	45	31.5	0	0.04	120	40.00	1	5	2	0	0	1	3	2	4	2	3	1	3	4	6	4.5	2640	880.00
3	4	38	57	47.5	0.05	2	90	30.00	1	15	2	0	0	3	3	4	6	5	6	1	3	2	7.5	20	4200	1400.00
4	4	20	20	20	0	1.3	100	33.33	1	5	1	5	60	2	6	6	2	6	6	1	3	3	30	30	3432	1144.00
5	4	0	13.6	6.8	0.005	0.12	20	20.00	1	5	2	0	0	3	6	6	6	6	6	2	1	3	0	5.6	1800	1800.00
3	4	10.4	14	12.2	0.15	1	200	50.00	1	25	2	0	0	2	3	4	6	5	6	1	4	2	11.5	60.6	938.64	234.66
3	4	2.6	4.4	3.5	1.4	0.6	25	25.00	1	40	2	0	0	3	4	5	6	5	6	1	1	4	0	12	2190	2190.00
1	4	21.39	35	28.195	0.003	0.6	150	30.00	1	10	2	0	0	1	2	2	1	1	4	2	5	3	32	17.2	562	112.40
1	1	21	40	30.5	0	0.008	150	50.00	1	10	2	0	0	1	4	1	3	1	4	1	3	3	27	38	900	300.00
3	4	5	10	7.5	0.1	1.5	150	50.00	2	30	2	0	0	2	3	4	5	5	5	1	3	3	4.5	33	168	56.00
3	4	12	28	20	0.02	0.06	50	25.00	1	15	2	0	0	3	3	4	6	4	6	1	2	1	32	60	5400	2700.00
1	1	20.31	60.31	40.31	0	0.05	250	50.00	1	10	2	0	0	2	2	1	3	2	4	2	5	3	40	30	12540	2508.00
1	1	36	36	36	0	1	90	10.00	1	2	2	0	0	2	4	6	6	6	4	1	9	1	26	32	1800	200.00
7	1	0	26	13	0	0.05	100	20.00	1	5	2	0	0	2	4	4	4	6	4	1	5	1	36	30	4200	840.00
7	7	0	0	0	0	0	112.5	16.07	1	1	2	0	0	2	4	4	4	6	4	1	7	1	37	8	1080	154.29
7	6	0	0	0	0.06	2	90	18.00	1	25	2	0	0	2	4	4	4	4	4	1	5	1	0	0	600	120.00
7	7	0	0	0	0.06	2.5	72	12.00	1	60	2	0	0	2	4	4	4	4	4	1	6	1	0	0	320	53.33
8	3	0	9	4.5	1.2	0.05	180	25.71	1	30	2	0	0	2	4	4	4	4	4	1	7	2	0	0	600	85.71
7	1	0	26	13	0.05	1	90	11.25	2	35	2	0	0	4	4	4	4	4	4	2	8	4	24	30	1260	157.50
7	3	0	3	1.5	1	0.02	90	15.00	1	15	2	0	0	2	2	2	4	4	4	2	6	1	25	36	806	134.33
7	7	0	0	0	0.06	0.06	150	21.43	1	20	2	0	0	2	4	4	6	4	4	2	7	1	10	20	3120	445.71
7	7	0	0	0	0.07	1.4	125	15.63	1	10	2	0	0	1	2	3	4	5	3	1	8	3	12	15	2160	270.00
2	7	45	0	22.5	0.05	1.2	72	18.00	2	30	2	0	0	1	4	5	5	4	4	2	4	1	6	90	1300	325.00
2	6	30	0	15	0.03	1.5	50	8.33	2	10	2	0	0	4	5	4	5	5	5	1	6	4	12	63	1775	295.83
2	2	27	24	25.5	0.15	2	112.5	28.13	1	15	2	0	0	1	1	2	4	4	5	2	4	2	10	60	3000	750.00
3	3	30	60	45	0.06	1.6	112.5	37.50	1	25	2	0	0	1	1	4	4	2	2	2	3	1	5	16	1335	445.00
2	2	78	63	70.5	0.05	1	250	27.78	1	15	2	0	0	2	1	2	4	4	4	1	9	1	8	30	5800	644.44
7	7	0	0	0	0.2	2.4	150	21.43	2	25	2	0	0	4	2	6	6	2	3	2	7	3	2.5	30	13000	1857.14
6	7	0	0	0	0.85	3	125	25.00	1	15	2	0	0	3	2	4	6	3	3	2	5	2	2	18.4	3200	640.00
2	2	8	12	10	0.3	2.5	25	25.00	2	25	2	0	0	4	5	4	5	4	4	1	1	3	15	24	2700	2700.00
2	2	30	48	39	0.05	1.5	25	12.50	1	5	2	0	0	4	5	2	5	4	3	2	2	2	12	30	15800	7900.00
7	7	0	0	0	0.12	2	125	31.25	1	15	2	0	0	2	3	6	6	4	5	2	4	2	1.6	30	1900	475.00
7	6	0	0	0	0.5	1.3	225	28.13	1	25	2	0	0	3	6	6	6	5	4	2	8	1	12	30	2750	343.75
7	7	0	0	0	1	0.6	112.5	16.07	2	30	2	0	0	2	4	2	3	5	4	2	7	5	25	32	11130	1590.00
1	1	27	27	27	0.05	0.18	125	20.83	1	0	2	0	0	4	4	2	5	5	2	1	6	3	30	40	10200	1700.00
3	4	12	24	18	0.055	0.35	150	21.43	1	15	2	0	0	2	4	3	4	4	2	1	7	4	15	40	4200	600.00
Mean		**11.74**	**17.25**	**14.49**	**0.170**	**0.974**	**135.87**	**26.23**		**15.39**											**5.52**	**2.39**	**18.66**	**32.40**	**4365.54**	**959.35**
Standard Deviation		**16.02**	**19.37**	**16.15**	**0.343**	**0.818**	**78.24**	**11.57**		**12.64**											**2.79**	**1.22**	**17.24**	**25.36**	**4839.90**	**1277.22**
Standard Error of the mean		**2.36**	**2.86**	**2.38**	**0.051**	**0.121**	**11.54**	**1.71**		**1.86**											**0.412**	**0.180**	**2.54**	**3.74**	**713.60**	**188.32**
Minimum		**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**20.00**	**8.33**	**1.00**	**0.00**	**1.00**	**0.00**	**0.00**	**1.00**	**1.00**	**1.00**	**1.00**	**1.00**	**1.00**	**1.00**	**1.00**	**1.00**	**0.00**	**0.00**	**168.00**	**53.33**
Maximum		**78.00**	**63.00**	**70.50**	**1.40**	**3.00**	**360.00**	**50.00**	**2.00**	**60.00**	**2.00**	**54.00**	**60.00**	**5.00**	**6.00**	**6.00**	**6.00**	**6.00**	**6.00**	**2.00**	**16.00**	**5.00**	**92.00**	**100.00**	**23840.00**	**7900.00**

Average household expenditure on water /month in rainy season (GH¢) 11.74
Average household expenditure on water /month in dry season (GH¢) 17.2
Average household expenditure on electricity/month (GH¢) 18.66
Average household expenditure on telephones (GH¢) 32.40

Average per capita consumption (l/p/d) = 26.23
Average annual household income (GH¢) = 4365.54
Average annual per capita income = 959.35
Average time to collect water home (min) = 15.4
Average distance from house to main source of water (m) = 170.17
Average distance from house to alterntv source of water (m) = 973.87
Average household size = 5.5
Average number of households/house = 2.4

Percentage of household who think their current water consumption is enough = 80.43
Percentage of households willing to pay more for water if there was improvement = 63.04

		Rainy season	Dry season		
Percentage of households depending on house pipe as main source of water	=	23.91	21.74	22.83	
Percentage of households depending on public stand pipe as main source of water	=	13.04	8.70	10.87	
Percentage of households depending on neighbours's house pipe as a main source	=	17.39	8.70	13.04	
Percentage of households depending on vendors as a main source of supply	=	4.35	23.91		46.74
Percentage of households depending on well as the main source of water supply	=	8.70	10.87		
Percentage of households depending on stream/river as the main water supply	=	2.17	6.52		
Percentage of households depending on borehole as the main source of supply	=	26.09	19.57		
Percentage of households depending on pond/dam as the main source of supply	=	2.17	0		
Percentage of households depending on other sources as the main sources of supply	=	2.17	0.00		

Consumer satisfaction

Percentage of Respondents (%)	**Very satisfied**	**Satisfied**	**Neither satisfied nor dissatisfied**	**Dissatisfied**	**Very dissatisfied**	**Don't know**
	1	**2**	**3**	**4**	**5**	**6**
Water quality	17.39	43.48	21.74	15.22	2.17	0
Hours of flow of water per day	6.52	17.39	19.57	34.78	15.22	6.52
Water pressure at taps	4.35	19.57	6.52	50.00	6.52	13.04
Complaints handling by service providers	6.52	4.35	6.52	36.96	17.39	28.26
Queues at water points	4.35	10.87	10.87	32.61	23.91	17.39
Water tariff	2.17	13.04	10.87	47.83	10.87	15.22

ASIAKWA Sources of water		Expenditure on water /month			Distances to sources (Km)		Water consumption			Time spent looking for water	Large storage facilities			Satisfaction						WTP more	Household characteristics		Expenditure on other utilities		Household income/annum	
Rainy season	Dry season	Rainy season	Dry season	Average	Main	Alternative	Quantity(lit)/day	lit/person/day	Is it enough?	Time (minutes)	Yes or No	Size (m^3)	Time to empty it(days)	Water quality	Hours of flow	Water pressure	Complaints handling	Queues	Water tariff		Size	No./house	Electricity/mth	Telephone/mth	Income	Per capita income
5	5	0	0	0	0.01	2	54	18.00	1	3	2	0	0	2	3	3	3	3	5	2	3	2	0	0	290	96.67
5	5	0	0	0	0.008	1.7	180	20.00	1	0	2	0	0	6	6	6	6	6	6	2	9	1	1.5	0	1562	173.56
2	2	24	24	24	0.016	1.5	180	36.00	2	2	2	0	0	1	1	1	1	1	1	2	5	3	1.5	16	4800	960.00
2	2	15	18	16.5	0.012	2.1	108	27.00	1	1	2	0	0	1	2	1	2	2	1	1	4	1	2.5	14	5200	1300.00
9	2	0	7.5	3.75	0.05	1	72	18.00	1	2	2	0	0	3	3	1	1	1	5	2	4	1	1.5	0	2100	525.00
6	6	0	0	0	0.2	0.2	225	56.25	1	30	2	0	0	5	4	4	5	6	5	1	4	2	2	2.8	360	90.00
1	1	10	10	10	0.004	1.3	225	25.00	1	0	2	0	0	2	2	1	2	1	2	1	9	1	2	40	1340	148.89
1	1	10	10	10	0	2	36	36.00	1	0	2	0	0	1	1	1	1	1	1	2	1	1	2	50	4038	4038.00
2	2	18	18	18	0.011	1	144	24.00	1	2	2	0	0	1	1	1	1	1	1	1	6	3	2	12	4500	750.00
2	2	9	18	13.5	0.012	0.7	54	27.00	1	2	2	0	0	1	1	2	1	1	2	1	2	1	2.5	12	6280	3140.00
2	2	6	30	18	0.02	1	108	21.60	1	3	2	0	0	2	1	1	2	1	1	1	5	2	1.5	14	2640	528.00
2	2	15	15	15	0.05	2	54	13.50	1	4	2	0	0	1	2	2	6	1	6	1	4	3	2	4	463	115.75
2	2	15	30	22.5	0.04	1.5	126	15.75	2	3	2	0	0	3	3	6	6	2	1	1	8	1	1.5	21	1020	127.50
2	2	7.5	11.4	9.45	0.05	1	72	18.00	1	5	2	0	0	1	2	2	3	2	3	1	4	2	8	63	250	62.50
2	2	3	9.9	6.45	0.015	1.2	80	16.00	1	5	2	0	0	2	2	2	3	2	4	1	5	3	3	2.1	240	48.00
2	2	6	10.5	8.25	0.01	2.2	144	28.80	1	6	2	0	0	2	1	1	2	1	2	2	5	2	1	2	762	152.40
9	2	0	6	3	0.06	2	126	31.50	1	6	2	0	0	2	3	2	4	2	4	2	4	2	0	4.5	312	78.00
2	2	12	12	12	0.04	2.5	72	24.00	1	3	2	0	0	2	1	1	2	2	3	2	3	1	0	0	960	320.00
5	2	0	9	4.5	0.025	1	108	21.60	1	5	2	0	0	4	2	2	3	2	4	2	5	2	0	8.4	60	12.00
9	2	0	9	4.5	0.05	1.6	108	27.00	1	6	2	0	0	4	2	2	3	2	4	2	4	1	1.5	2	2248	562.00
2	2	7.5	7.5	7.5	0.03	0.7	72	18.00	1	2	2	0	0	2	2	1	3	2	3	2	4	1	0	0	170	42.50
6	6	0	0	0	0.1	0.1	225	56.25	1	10	2	0	0	3	6	6	6	6	6	2	4	2	2	2.8	400	100.00
9	6	0	0	0	0	0.15	144	20.57	1	15	2	0	0	2	2	3	6	1	1	2	7	1	1.5	2.4	1302.2	186.03
Mean		**6.87**	**11.12**	**9.00**	**0.035**	**1.32**	**118.13**	**26.08**		**5.00**											**4.74**	**1.70**	**1.72**	**11.87**	**1795.53**	**589.43**
Standard Deviation		**7.10**	**8.84**	**7.42**	**0.043**	**0.685**	**57.80**	**11.28**		**6.42**											**1.98**	**0.76**	**1.63**	**16.98**	**1878.93**	**1011.36**
Standard Error of the mean		**1.48**	**1.84**	**1.55**	**0.009**	**0.143**	**12.05**	**2.35**		**1.338**											**0.413**	**0.159**	**0.340**	**3.54**	**391.78**	**210.88**
Minimum		**0.00**	**0.00**	**0.00**	**0.00**	**0.10**	**36.00**	**13.50**	**1.00**	**0.00**	**2.00**	**0.00**	**0.00**	**1.00**	**1.00**	**1.00**	**1.00**	**1.00**	**1.00**	**1.00**	**1.00**	**1.00**	**0.00**	**0.00**	**60.00**	**12.00**
Maximum		**24.00**	**30.00**	**24.00**	**0.20**	**2.50**	**225.00**	**56.25**	**2.00**	**30.00**	**2.00**	**0.00**	**0.00**	**6.00**	**6.00**	**6.00**	**6.00**	**6.00**	**6.00**	**2.00**	**9.00**	**3.00**	**8.00**	**63.00**	**6280.00**	**4038.00**

Average household expenditure on water /month in rainy season (GH¢) = 6.87
Average household expenditure on water /month in dry season (GH¢) = 11.1
Average household expenditure on electricity/month (GH¢) = 1.72
Average household expenditure on mobile phones (GH¢) = 11.87

Average per capita consumption (l/p/d) = 26.08
Average annual household income (GH¢) = 1795.53
Average annual per capita income = 589.43
Average time to collect water home (min) = 5.0
Average distance from house to main source of water (m) = 35.35
Average distance from house to alterntv source of water (m) = 1323.91
Average household size = 4.74
Average number of households/house = 1.7

Percentage of household who think their current water consumption is enough = 91.3
Percentage of households willing to pay more for water if there was improvement = 43.5

		Rainy season	Dry season		
Percentage of households depending on house pipe as main source of water	=	8.70	8.70	8.70	
Percentage of households depending on public stand pipe as main source of water	=	52.17	69.57	60.87	
Percentage of households depending on neighbours's house pipe as a main source	=	0	0	0.00	69.57
Percentage of households depending on vendors as a main source of supply	=	0	0		
Percentage of households depending on well as the main source of water supply	=	13.04	8.70		
Percentage of households depending on stream/river as the main water supply	=	8.70	13.04		
Percentage of households depending on borehole as the main source of supply	=	0	0		
Percentage of households depending on pond/dam as the main source of supply	=	0	0		
Percentage of households depending on other sources as the main sources of supply	=	17.39	0		

Consumer satisfaction

Percentage of Respondents (%)	**Very satisfied**	**Satisfied**	**Neither satisfied nor dissatisfied**	**Dissatisfied**	**Very dissatisfied**	**Don't know**
	1	**2**	**3**	**4**	**5**	**6**
Water quality	30.43	39.13	13.04	8.70	4.35	4.35
Hours of flow of water per day	30.43	39.13	17.39	4.35	0	8.70
Water pressure at taps	43.48	30.43	8.70	4.35	0	13.04
Complaints handling by service providers	21.74	21.74	26.09	4.35	4.35	21.74
Queues at water points	43.48	39.13	4.35	0.00	0.00	13
Water tariff	30.43	13.04	13.04	17.39	13.04	13.04

ATEBUBU Sources of water		Expenditure on water /month			Distances to sources (Km)		Water consumption			Time spent looking for water	Large storage facilities			Satisfaction						WTP more	Household characteristics		Expenditure on other utilities		Household income/annum	
Rainy season	Dry season	Rainy season	Dry season	Average	Main	Alternative	Quantity(lit)/day	lit/person/day	Is it enough?	Time (minutes)	Yes or No	Size (m^3)	Time to empty it(days)	Water quality	Hours of flow	Water pressure	Complaints handling	Queues	Water tariff		Size	No./house	Electricity/mth	Telephone/mth	Income	Per capita income
2	2	15	24	19.5	0.01	0.15	225	22.50	2	60	2	0	0	1	5	3	4	5	2	1	10	4	90	30	1210	121.00
7	7	30	30	30	0.02	0.5	90	12.86	1	60	2	0	0	4	3	4	5	4	5	1	7	4	0	30	2640	377.14
5	5	0	0	0	0	0.8	112.5	3.88	2	90	2	0	0	4	4	2	6	5	5	1	29	6	25	58	2172	74.90
2	2	18	30	24	0.1	0.15	112.5	8.65	2	120	2	0	0	4	5	4	6	5	2	1	13	4	0	20	3420	263.08
5	2	0	10	5	0.4	1.6	225	10.71	2	45	2	0	0	4	5	5	6	5	4	1	21	5	15	30	3600	171.43
1	1	6	6	6	0	0.8	108	13.50	1	0	2	0	0	2	1	2	3	3	2	2	8	2	4	13	3130	391.25
2	2	9	9	9	0.15	0.5	90	9.00	1	30	2	0	0	1	4	4	2	4	4	2	10	1	20	20	3760	376.00
1	1	4	8	6	0	0.3	112.5	16.07	1	0	2	0	0	1	2	3	3	3	2	2	7	1	5	8	2400	342.86
1	1	4	4	4	0	0.5	72	18.00	1	30	2	0	0	2	4	2	3	4	2	1	4	1	2	12	3600	900.00
2	2	40.5	40.5	40.5	0.2	0.5	225	28.13	1	60	2	0	0	2	4	4	3	3	2	2	8	4	15	8	3000	375.00
1	1	12	15	13.5	0	0.5	225	20.45	2	30	2	0	0	1	5	5	4	5	2	2	11	3	9	20	1090	99.09
2	2	6	9	7.5	0.06	2.4	100	9.09	2	120	2	0	0	1	5	3	4	5	2	2	11	4	3	60	2040	185.45
2	2	21	21	21	0.1	1.6	225	32.14	2	45	2	0	0	1	4	4	5	5	4	1	7	4	8	8	96	13.71
5	8	0	0	0	1.6	3	250	50.00	2	45	2	0	0	4	3	2	5	5	2	2	5	10	1.8	30	405	81.00
2	2	15	45	30	0.02	1.6	225	25.00	2	45	2	0	0	2	5	5	4	5	2	2	9	4	4	12	1800	200.00
2	2	4	6	5	0.5	1	72	14.40	2	120	2	0	0	3	5	4	4	5	5	1	5	5	2	0	240	48.00
1	1	8	12	10	0	1.5	225	32.14	1	45	2	0	0	2	4	4	2	1	3	1	7	5	15	16	600	85.71
2	2	10	12.5	11.25	0.3	2.5	108	18.00	2	120	2	0	0	4	4	4	5	5	5	2	6	5	0	0	1750	291.67
1	1	4	4	4	0	0.05	90	22.50	2	30	2	0	0	5	4	3	4	4	5	2	4	15	5	28	2520	630.00
1	1	6	18	12	0	0.6	112.5	22.50	1	5	2	0	0	4	4	4	5	5	5	1	5	3	6	12.5	6160	1232.00
2	2	15	27	21	0.05	1.5	150	30.00	1	60	2	0	0	2	4	5	5	5	2	1	5	9	5	16	2236	447.20
5	5	5.3	5.3	5.3	0.05	2	300	60.00	1	0	2	0	0	1	2	2	3	1	1	1	5	13	4	12	4993.5	998.70
3	3	12	21	16.5	0.04	0.5	120	20.00	2	30	2	0	0	2	4	2	5	2	2	1	6	9	4.5	12	3020	503.33
1	1	5	21	13	0	0.4	100	20.00	2	2	2	0	0	2	4	4	5	4	2	1	5	14	4.5	28	3934	786.80
2	4	12	21	16.5	0.3	2	150	30.00	2	90	2	0	0	2	4	5	4	5	2	1	5	4	3	8	1825	365.00
5	5	0	0	0	0	2.5	335.5	22.37	1	0	2	0	0	2	4	6	6	5	2	1	15	1	22	60	11180	745.33
2	2	6	6	6	0.2	0.01	100	7.69	1	45	2	0	0	2	5	6	4	5	2	1	13	1	42	8	3940	303.08
5	2	0	20	10	0	0.2	112.5	22.50	2	60	2	0	0	2	5	6	6	5	4	2	5	9	12	12	2440	488.00
5	2	0	12	6	0	0.02	112.5	16.07	2	20	2	0	0	2	4	2	4	5	2	2	7	3	30	56	5060	722.86
2	2	60	60	60	0.2	0.4	112.5	14.06	1	30	2	0	0	2	5	6	6	5	2	1	8	1	0	8	2472	309.00
5	5	0	0	0	0	0.2	225	37.50	1	0	2	0	0	1	4	6	6	6	5	2	6	2	10	5	75	12.50
5	2	0	21	10.5	0	1.1	126	7.41	2	45	2	0	0	1	4	4	2	5	2	1	17	5	12	30	9054	532.59
5	2	0	9	4.5	0.5	1.45	225	45.00	2	180	2	0	0	3	5	5	1	5	3	1	5	4	18	30	3810	762.00
5	2	0	3	1.5	0.4	2	225	11.25	2	120	2	0	0	2	4	5	5	5	6	1	20	1	20	12	2600	130.00
5	8	0	0	0	0	2.4	125	13.89	2	90	2	0	0	5	6	6	6	6	6	1	9	1	15	15	1170	130.00
5	2	0	18	9	0	0.04	450	40.91	2	120	2	0	0	1	5	4	3	5	6	1	11	1	25	0	1030	93.64
1	1	35.5	35.5	35.5	0	0.5	112.5	18.75	2	45	1	0.7	14	4	4	4	5	3	2	2	6	1	25	225	29320	4886.67
1	1	0	0	0	0	0.2	75	25.00	1	10	2	0	0	4	5	5	6	2	4	2	3	1	12	35	5400	1800.00
1	1	15.14	15.14	15.14	0	0.25	225	22.50	2	30	2	0	0	4	4	4	4	3	3	1	10	1	47.9	70	6500	650.00
7	7	0	0	0	0.045	3	112.5	14.06	1	10	2	0	0	2	4	4	4	2	2	2	8	4	6	20	3770	471.25
1	1	45	45	45	0	0.25	168.75	15.34	2	45	1	2.25	4.5	2	4	4	2	2	3	1	11	1	45	65	3750	340.91
Mean		**10.33**	**15.71**	**13.02**	**0.128**	**1.01**	**162.63**	**21.56**		**52.00**											**8.95**	**4.29**	**14.46**	**27.87**	**3736.89**	**530.20**
Standard Deviation		**13.84**	**14.39**	**13.62**	**0.277**	**0.90**	**81.70**	**12.06**		**43.41**											**5.26**	**3.70**	**17.20**	**36.65**	**4675.85**	**785.69**
Standard Error of the mean		**2.16**	**2.25**	**2.13**	**0.043**	**0.141**	**12.76**	**1.88**		**6.78**											**0.821**	**0.577**	**2.69**	**5.72**	**730.25**	**122.70**
Minimum		**0.00**	**0.00**	**0.00**	**0.00**	**0.01**	**72.00**	**3.88**	**1.00**	**0.00**	**1.00**	**0.00**	**0.00**	**1.00**	**1.00**	**2.00**	**1.00**	**1.00**	**1.00**	**1.00**	**3.00**	**1.00**	**0.00**	**0.00**	**75.00**	**12.50**
Maximum		**60.00**	**60.00**	**60.00**	**1.60**	**3.00**	**450.00**	**60.00**	**2.00**	**180.00**	**2.00**	**2.25**	**14.00**	**5.00**	**6.00**	**6.00**	**6.00**	**6.00**	**6.00**	**2.00**	**29.00**	**15.00**	**90.00**	**225.00**	**29320.00**	**4886.67**

Average household expenditure on water /month in rainy season (GH¢) 10.33
Average household expenditure on water /month in dry season (GH¢) 15.7
Average household expenditure on electricity/month (GH¢) 14.46
Average household expenditure on telephones (GH¢) 27.87

Average per capita consumption (l/p/d) = 21.56
Average annual household income (GH¢) = 3736.89
Average annual per capita income = 530.20
Average time to collect water home (min) = 52.0
Average distance from house to main source of water (m) = 127.93
Average distance from house to alterntv source of water (m) = 1011.46
Average household size = 9.0
Average number of households/house = 4.3

Percentage of household who think their current water consumption is enough = 39.02
Percentage of households willing to pay more for water if there was improvement = 60.98

	Rainy season	Dry season		
Percentage of households depending on house pipe as main source of water =	29.27	29.27	29.27	
Percentage of households depending on public stand pipe as main source of water =	31.71	46.34	39.02	
Percentage of households depending on neighbours's house pipe as a main source =	2.44	2.44	2.44	70.73
Percentage of households depending on vendors as a main source of supply =	0	2.44		
Percentage of households depending on well as the main source of water supply =	31.71	9.76		
Percentage of households depending on stream/river as the main water supply =	0.00	0.00		
Percentage of households depending on borehole as the main source of supply =	4.88	4.88		
Percentage of households depending on pond/dam as the main source of supply =	0	4.88		
Percentage of households depending on other sources as the main sources of supply =	0.00	0.00		

Consumer satisfaction

Percentage of Respondents (%)	Very satisfied	Satisfied	Neither satisfied nor dissatisfied	Dissatisfied	Very dissatisfied	Don't know
	1	**2**	**3**	**4**	**5**	**6**
Water quality	24.39	41.46	4.88	24.39	4.88	0
Hours of flow of water per day	2.44	4.88	4.88	53.66	32	2.44
Water pressure at taps	0.00	17.07	9.76	39.02	19.51	14.63
Complaints handling by service providers	2.44	9.76	14.63	26.83	24.39	21.95
Queues at water points	4.88	9.76	12.20	12.20	56.10	5
Water tariff	2.44	51.22	9.76	12.20	17.07	7.32

BEKWAI

Sources of water		Expenditure on water /month			Distances to sources (Km)		Water consumption			Time spent looking for water	Large storage facilities			Satisfaction						WTP more	Household characteristics		Expenditure on other utilities		Household income/annum	
Rainy season	Dry season	Rainy season	Dry season	Average	Main	Alternative	Quantity(lit)/day	lit/person/day	Is it enough?	Time (minutes)	Yes or No	Size (m^3)	Time to empty it(days)	Water quality	Hours of flow	Water pressure	Complaints handling	Queues	Water tariff		Size	No./house	Electricity/mth	Telephone/mth	Income	Per capita income
2	2	10	15	12.5	0.15	0.4	270	33.75	1	5	2	0	0	2	2	3	1	2	3	2	8	2	0	8	152	19.00
2	2	5	6	5.5	0.2	0.4	180	25.71	1	6	2	0	0	4	2	2	4	3	4	2	7	5	1.5	0	6280	897.14
2	2	5	5	5	0.12	0.3	100	20.00	1	6	2	0	0	4	1	2	3	1	4	1	5	4	0.9	0	350	70.00
6	6	0	0	0	0.1	0.5	50	12.50	2	5	2	0	0	5	2	1	3	4	3	2	4	4	4	8	420	105.00
1	1	6	6	6	0	0.5	144	28.80	1	0	2	0	0	4	2	2	4	1	3	2	5	2	3	4	840	168.00
2	2	6	6	6	0.035	0.35	361	60.17	2	5	2	0	0	3	3	3	2	4	4	1	6	6	35	46	7980	1330.00
7	7	0	0	0	0	0.1	50	7.14	1	2	2	0	0	1	1	1	3	3	1	1	7	2	90	20	4640	662.86
2	2	15	15	15	0.1	0.01	225	20.45	1	15	2	0	0	3	2	2	2	3	3	1	11	6	9.1	7.2	3132.5	284.77
2	2	7.5	9	8.25	0.25	0.4	100	25.00	1	10	2	0	0	2	3	2	1	2	3	1	4	5	1.2	5	3720	930.00
2	2	18	21	19.5	0.15	0.45	250	25.00	1	25	2	0	0	4	2	1	1	3	2	1	10	10	30	22.4	8215	821.50
2	2	9	9	9	0.05	0.25	125	20.83	1	5	2	0	0	1	3	2	2	3	4	1	6	8	8	24	7777.5	1296.25
2	2	8	10	9	0.06	0.5	400	57.14	1	24	2	0	0	1	2	3	2	3	4	1	7	1	10	40	368	52.57
2	2	12	14	13	0.02	0.3	50	10.00	1	5	2	0	0	3	2	2	3	3	2	1	5	4	7	24	400	80.00
2	2	6	6	6	0.05	0.5	250	27.78	1	10	2	0	0	3	3	2	3	3	3	1	9	3	10	40	7200	800.00
7	7	0	0	0	0	0	200	33.33	1	3	2	0	0	1	1	2	2	2	2	2	6	3	15	25	3000	500.00
7	7	0	0	0	0.005	0.14	216	30.86	1	3	2	0	0	1	1	2	3	1	4	2	7	3	15	20	4440	634.29
3	3	6	8	7	0.01	1.2	100	25.00	1	5	2	0	0	1	2	2	1	1	1	1	4	5	15	30	5600	1400.00
2	2	6	6	6	0.06	0.8	216	30.86	1	5	2	0	0	3	2	2	3	3	2	1	7	4	10	40	500	71.43
2	2	3	3	3	0.1	0.5	75	10.71	1	10	2	0	0	3	2	2	3	3	3	1	7	3	5	16	650	92.86
2	2	6	6	6	0.09	0.85	150	30.00	1	10	2	0	0	3	2	2	3	3	4	2	5	1	30	20	3600	720.00
2	2	9	9	9	0.15	0.25	125	31.25	1	5	2	0	0	1	5	1	1	3	4	2	4	7	2.5	60	1200	300.00
2	2	18	18	18	0.15	0.1	100	12.50	1	8	2	0	0	2	1	1	1	2	4	2	8	1	0	6	355	44.38
2	2	6	6	6	0.05	0.1	143	14.30	1	2	2	0	0	2	2	1	1	4	5	2	10	3	8	24	1680	168.00
2	2	10.5	10.5	10.5	0.15	0.45	180	60.00	2	10	2	0	0	1	2	1	1	3	3	2	3	4	2.5	9.6	2271	757.00
2	2	15	18	16.5	0.05	0.4	25	8.33	1	10	2	0	0	2	2	1	1	3	3	1	3	3	6.5	10.8	1024	341.33
5	5	0	0	0	0.3	0.1	144	36.00	1	30	2	0	0	6	6	6	6	6	6	2	4	13	3	0	1202	300.50
5	5	0	0	0	0.03	0.4	270	54.00	1	2	2	0	0	6	6	6	6	6	6	2	5	1	10	48	2100	420.00
5	5	6	9	7.5	0.075	0.15	50	8.33	2	5	2	0	0	2	2	2	6	3	4	1	6	2	2	30	500	83.33
5	5	0	0	0	0.04	0.17	161	23.00	1	15	2	0	0	6	6	6	6	6	6	1	7	1	0	0	720	102.86
2	2	6	6	6	0.07	0.11	54	18.00	1	4	2	0	0	4	1	1	5	2	1	1	3	2	0	32	250	83.33
1	1	4.8	4.8	4.8	0	0.3	150	30.00	1	1	2	0	0	1	1	2	1	1	4	2	5	1	17	35	1070.4	214.08
6	2	0	18	9	0.5	0.05	80	20.00	2	30	2	0	0	4	4	4	2	5	1	1	4	5	8	8	1890	472.50
2	2	6	6	6	0.05	0.1	180	15.00	1	5	2	0	0	4	2	2	2	2	2	2	12	4	10	40	2060	171.67
5	2	0	12	6	0.03	0.65	200	16.67	1	10	2	0	0	4	4	4	5	3	1	1	12	11	10	6	1156	96.33
2	2	9	9	9	0.01	0.2	360	45.00	2	30	2	0	0	4	1	2	3	4	5	2	8	8	0	0	1800	225.00
2	2	4.5	9	6.75	0.03	0.4	100	25.00	1	10	2	0	0	4	2	2	2	4	4	2	4	5	5	0	2160	540.00
7	7	0	0	0	0	0.05	92	15.33	1	1	2	0	0	1	1	1	6	1	3	2	6	4	15	12	9924	1654.00
9	2	0	9	4.5	0	0.15	150	18.75	2	6	2	0	0	1	4	3	4	4	2	2	8	5	15	4	1800	225.00
2	2	3	3	3	0.03	0.17	25	25.00	2	5	2	0	0	2	2	3	2	2	4	2	1	6	0	0	0	0.00
3	3	0	0	0	0.2	0.35	150	30.00	2	15	2	0	0	2	2	2	2	2	1	2	5	6	1.5	0	1364	272.80
2	2	3	6	4.5	0.012	0.5	200	28.57	1	5	2	0	0	2	2	2	2	2	4	2	7	4	7	8	730	104.29
5	5	0	0	0	0	1	250	22.73	1	10	2	0	0	1	1	1	1	2	2	2	11	1	18	16	200	18.18
1	1	6	6	6	0	0.05	100	20.00	1	2	2	0	0	4	2	2	1	2	1	2	5	1	17	30	1095	219.00
5	5	0	0	0	0.03	0.07	200	22.22	1	3	2	0	0	1	2	2	1	1	1	2	9	5	15	6	3300	366.67
2	2	10	12	11	0.3	0.5	450	32.14	1	30	2	0	0	1	2	2	5	4	1	1	14	11	25	2	2431	173.64
5	5	0	0	0	0	1	150	25.00	2	35	2	0	0	2	2	1	2	2	6	1	6	5	0	2.4	780	130.00
2	2	8	9	8.5	0.085	2	225	28.13	1	15	2	0	0	3	2	1	4	2	2	1	8	1	15	24	4020	502.50
2	2	4.5	4.5	4.5	0.055	0.121	86	21.50	1	10	2	0	0	3	1	2	2	2	1	1	4	7	15	60	972	243.00
2	2	6	6	6	0.075	0.22	225	28.13	1	20	2	0	0	2	1	2	2	2	2	1	8	1	12	16	4200	525.00
5	5	0	0	0	0.005	0.03	112.5	22.50	1	20	2	0	0	2	2	1	6	2	2	1	5	1	3	4	1032	206.40
2	2	9	9	9	0.05	2	360	25.71	1	5	2	0	0	2	1	1	1	2	2	2	14	1	30	0	1030	73.57
5	7	0	0	0	0	0.5	225	25.00	2	20	2	0	0	2	1	2	2	3	6	2	9	6	15	24	2357	261.89
Mean		**5.25**	**6.63**	**5.94**	**0.078**	**0.406**	**169.89**	**25.83**		**10.35**											**6.69**	**4.17**	**11.30**	**17.64**	**2421.89**	**389.08**
Standard Deviation		**4.85**	**5.57**	**4.96**	**0.096**	**0.420**	**97.39**	**12.12**		**8.99**											**2.83**	**2.89**	**14.15**	**16.34**	**2420.55**	**392.00**
Standard Error of the mean		**0.673**	**0.772**	**0.688**	**0.013**	**0.058**	**13.51**	**1.68**		**1.25**											**0.393**	**0.401**	**1.96**	**2.27**	**335.67**	**54.36**
Minimum		**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**25.000**	**7.143**	**1.000**	**0.000**	**2.000**	**0.000**	**0.000**	**1.000**	**1.000**	**1.000**	**1.000**	**1.000**	**1.000**	**1.000**	**1.000**	**1.000**	**0.000**	**0.000**	**0.000**	**0.000**
Maximum		**18.000**	**21.000**	**19.500**	**0.500**	**2.000**	**450.000**	**60.167**	**2.000**	**35.000**	**2.000**	**0.000**	**0.000**	**6.000**	**6.000**	**6.000**	**6.000**	**6.000**	**6.000**	**2.000**	**14.000**	**13.000**	**90.000**	**60.000**	**9924.000**	**1654.000**

Average household expenditure on water /month in rainy season (GH¢) 5.25
Average household expenditure on water /month in dry season (GH¢) 6.6
Average household expenditure on electricity/month (GH¢) 11.30
Average household expenditure on mobile phones (GH¢) 17.64

Average per capita consumption (l/p/d) = 25.83
Average annual household income (GH¢) = 2421.89
Average annual per capita income = 389.08
Average time to collect water home (min) = 10.3
Average distance from house to main source of water (m) = 78.40
Average distance from house to alterntv source of water (m) = 405.60
Average household size = 6.7
Average number of households/house = 4.2

Percentage of household who think their current water consumption is enough = 78.85
Percentage of households willing to pay more for water if there was improvement = 48.08

	Rainy season	Dry season		
Percentage of households depending on house pipe as main source of water =	5.77	5.77	5.77	
Percentage of households depending on public stand pipe as main source of water =	57.69	63.46	60.58	
Percentage of households depending on neighbours's house pipe as a main source =	3.85	3.85	3.85	70.19
Percentage of households depending on vendors as a main source of supply =	0.00	0.00		
Percentage of households depending on well as the main source of water supply =	19.23	15.38		
Percentage of households depending on stream/river as the main water supply =	3.85	1.92		
Percentage of households depending on borehole as the main source of supply =	7.69	9.62		
Percentage of households depending on pond/dam as the main source of supply =	0.00	0		
Percentage of households depending on other sources as the main sources of supply =	1.92	0.00		
	100.00	100.00		

Consumer satisfaction

Percentage of Respondents (%)	Very satisfied	Satisfied	Neither satisfied nor dissatisfied	Dissatisfied	Very dissatisfied	Don't know
	1	2	3	4	5	6
Water quality	26.92	26.92	17.31	21.15	1.92	5.77
Hours of flow of water per day	26.92	51.92	7.69	5.77	1.92	5.77
Water pressure at taps	28.85	51.92	9.62	3.85	0.00	5.77
Complaints handling by service providers	26.92	28.85	19.23	7.69	5.77	11.54
Queues at water points	13.46	32.69	32.69	13.46	1.92	5.77

BOLE

Sources of water		Expenditure on water /month		Distances to sources (Km)		Water consumption			Time spent looking for water	Large storage facilities			Satisfaction						WTP more	Household characteristics		Expenditure on other utilities		Household income/annum		
Rainy season	Dry season	Rainy season	Dry season	Main	Alternative	Quantity(lit)/day	lit/person/day	Is it enough?	Time (minutes)	Yes or No	Size (m3)	Time to empty it (days)	Water quality	Hours of flow	Water pressure	Complaints handling	Queues	Water tariff		Size	No./house	Electricity/mth	Telephone/mth	Income	Per capita income	Average expendi
1	1	4	4	0	0.5	225	20.45	2	2	2	0	0	2	5	4	4	2	5	1	11	2	40	24	2400	218.18	4
2	2	3	6	0.05	0.2	225	10.71	2	30	2	0	0	1	4	4	4	4	5	1	21	4	5	40	1800	85.71	4.5
2	2	0.9	1.2	0.25	0.2	324	29.45	1	45	2	0	0	2	4	2	4	4	3	1	11	5	4	8	5100	463.64	1.05
1	1	4	4	0	0.3	56.25	7.03	1	1	2	0	0	2	2	4	2	1	4	1	8	1	6.34	42	7860	982.50	4
2	7	9.75	6	0.5	1.5	450	30.00	1	45	2	0	0	4	4	4	4	6	4	1	15	2	5.6	14	2740	182.67	7.875
2	2	9	13.5	0.65	0.3	225	32.14	1	37.5	2	0	0	2	4	4	5	5	4	2	7	2	0	0	730	104.29	11.25
2	4	6	0.75	0.35	1	337.5	30.68	1	32.5	2	0	0	1	5	4	4	4	2	1	11	4	15	56	3621	329.18	3.375
2	2	1.2	1.2	0.5	0.5	180	30.00	2	45	2	0	0	2	4	2	4	4	4	2	6	7	2	4	120	20.00	1.2
1	1	6.83	6.83	0	0.02	450	19.57	1	2	2	0	0	2	4	4	2	1	4	1	23	1	6	40	7440	323.48	6.83
1	1	1.65	1.65	0	0.25	108	21.60	1	2.5	2	0	0	2	2	2	4	1	4	1	5	10	6	24	1360	272.00	1.65
1	1	4	4	0	0.9	225	25.00	2	35	1	2.25	4	2	4	2	4	1	4	1	9	1	7	8	2600	288.89	4
2	2	4.9	5.8	0.42	0.78	108	15.43	2	25	2	0	0	2	4	2	2	4	2	1	7	1	3	12	240	34.29	5.35
1	1	4	4	0	0.33	450	34.62	1	3	2	0	0	2	4	2	3	6	4	1	13	1	8	60	2160	166.15	4
2	2	9	9	0.25	1.12	225	25.00	1	22.5	2	0	0	2	4	3	4	4	2	1	9	5	8	2.4	220	24.44	9
1	1	6	7	0.01	0.55	225	45.00	1	4	2	0	0	1	2	2	4	1	4	1	5	14	11	29	6000	1200.00	6.5
Mean		**4.95**	**5.00**	**0.199**	**0.563**	**254.25**	**25.11**		**22.13**											**10.73**	**4.00**	**8.46**	**24.23**	**2959.40**	**313.03**	**4.97**
Standard Deviation		**2.81**	**3.38**	**0.233**	**0.414**	**125.18**	**9.73**		**17.90**											**5.40**	**3.82**	**9.44**	**19.60**	**2553.99**	**343.29**	**2.89**
Standard Error of the mean		**0.562**	**0.874**	**0.060**	**0.107**	**32.32**	**2.51**		**4.62**											**1.40**	**0.99**	**2.44**	**5.06**	**659.44**	**88.64**	**0.75**
Minimum		**0.900**	**0.750**	**0.000**	**0.020**	**56.250**	**7.031**	**1.000**	**1.000**	**1.000**	**0.000**	**0.000**	**1.000**	**2.000**	**2.000**	**2.000**	**1.000**	**2.000**	**1.000**	**5.000**	**1.000**	**0.000**	**0.000**	**120.000**	**20.000**	**1.050**
Maximum		**9.750**	**13.500**	**0.650**	**1.500**	**450.000**	**45.000**	**2.000**	**45.000**	**2.000**	**2.250**	**4.000**	**4.000**	**5.000**	**4.000**	**5.000**	**6.000**	**5.000**	**2.000**	**23.000**	**14.000**	**40.000**	**60.000**	**7860.000**	**1200.000**	**11.250**

Average household expenditure on water /month in rainy season (GH¢)	4.95	Average per capita consumption (l/p/d) =	25.11	Percentage of household who think their current water consumption is enough =	66.7
Average household expenditure on water /month in dry season (GH¢)	5.0	Average annual household income (GH¢) =	2959.40	Percentage of households willing to pay more for water if there was improvement =	86.7
Average household expenditure on electricity/month (GH¢)	8.46	Average annual per capita income =	313.03		
Average household expenditure on mobile phones (GH¢)	24.23	Average time to collect water home (min) =	22.13		
		Average distance from house to main source of water (m) =	198.67		
		Average distance from house to alterntv source of water (m) =	563.33		
		Average household size =	10.73		
		Average number of households/house =	4		

	Rainy season	Dry season		
Percentage of households depending on house pipe as main source of water =	46.67	46.67	46.67	
Percentage of households depending on public stand pipe as main source of water =	53.33	40.00	46.67	
Percentage of households depending on neighbours's house pipe as a main source =	0	0	0.00	93.33
Percentage of households depending on vendors as a main source of supply =	0	6.67		
Percentage of households depending on well as the main source of water supply =	0.00	0.00		
Percentage of households depending on stream/river as the main water supply =	0.00	0.00		
Percentage of households depending on borehole as the main source of supply =	0	6.67		
Percentage of households depending on pond/dam as the main source of supply =	0	0		
Percentage of households depending on rainfall as the main sources of supply =	0.00	0.00		

Consumer satisfaction

Percentage of Respondents (%)	Very satisfied	Satisfied	Neither satisfied nor dissatisfied	Dissatisfied	Very dissatisfied	Don't know
	1	2	3	4	5	6
Water quality	20.00	73.33	0.00	6.67	0.00	0.00
Hours of flow of water per day	0.00	20.00	0.00	66.67	13.33	0.00
Water pressure at taps	0.00	46.67	6.67	46.67	0.00	0.00
Complaints handling by service providers	0.00	20.00	6.67	66.67	6.67	0.00
Queues at water points	33.33	6.67	0.00	40.00	6.67	13.33
Water tariff	0.00	20.00	6.67	60.00	13.33	0.00

DAMONGO Sources of water		Expenditure on water /month		Distances to sources (Km)		Water consumption			Time spent looking for water	Large storage facilities			Satisfaction						WTP more	Household characteristics		Expenditure on other utilities		Household income/annum		
Rainy season	Dry season	Rainy season	Dry season	Main	Alternative	Quantity(lit)/day	lit/person/day	Is it enough?	Time (minutes)	Yes or No	Size (m^3)	Time to empty it(days)	Water quality	Hours of flow	Water pressure	Complaints handling	Queues	Water tariff		Size	No./house	Electricity/mth	Telephone/mth	Income	Per capita income	Average exp
2	2	6	12	0.2	1.6	112.5	22.50	2	210	2	0	0	2	4	4	4	4	2	1	5	3	4	16	100	20.00	9
7	7	15	31.5	0.2	4.8	112.5	16.07	2	240	2	0	0	2	2	2	2	4	2	1	7	4	11	20	870	124.29	23.25
2	2	48	48	0.2	3.2	225	28.13	1	180	2	0	0	1	2	4	2	2	2	1	8	1	10	0	608	76.00	48
2	2	24	24	0.02	1.6	112.5	22.50	1	60	2	0	0	1	2	4	2	2	2	1	5	2	32	60	2738	547.60	24
7	4	15	27	2.4	0.02	112.5	18.75	1	90	2	0	0	1	2	2	2	4	2	1	6	7	15	32	7860	1310.00	21
5	2	0	30	0.5	1	225	37.50	1	30	2	0	0	1	4	3	6	5	4	2	6	1	5	0	8260	1376.67	15
5	2	0	24	0.5	0.5	450	34.62	2	30	2	0	0	2	4	4	4	5	3	1	13	1	30	25	3120	240.00	12
2	2	60	60	0.1	1	450	26.47	2	15	2	0	0	1	2	4	6	4	3	1	17	1	6	60	2750	161.76	60
7	7	15	15	1	0.5	225	25.00	2	20	2	0	0	1	4	3	6	4	2	1	9	1	30	40	7360	817.78	15
2	2	12	12	0.5	0.5	225	14.06	2	20	2	0	0	1	4	2	6	2	3	1	16	1	7	15	2465	154.06	12
7	7	6	6	0.5	0.5	225	32.14	1	30	2	0	0	1	2	2	2	2	2	1	7	2	3	0	224	32.00	6
7	7	5	6	0.2	0.2	56.25	14.06	1	30	2	0	0	1	2	2	2	4	2	1	4	1	3	0	275	68.75	5.5
7	7	13	18	0.5	0.5	75	18.75	1	60	2	0	0	2	2	2	2	4	2	1	4	3	3	25	4944	1236.00	15.5
7	7	21	21	0.5	0.5	225	28.13	2	60	2	0	0	1	4	4	6	5	5	1	8	2	1.9	20	880	110.00	21
2	7	12	10.5	0.5	1	112.5	16.07	2	15	2	0	0	2	2	3	4	5	2	1	7	2	0	0	20	2.86	11.25
7	4	2.4	12	0.5	1.25	112.5	18.75	2	60	2	0	0	1	4	4	4	4	4	1	6	3	35	63	1272	212.00	7.2
7	7	36	36	0.5	0.5	112.5	28.13	2	40	2	0	0	2	3	2	4	5	2	1	4	8	15	20	3240	810.00	36
7	7	15	15	0.5	1	225	32.14	1	30	2	0	0	1	2	2	6	4	2	2	7	3	0	0	140	20.00	15
7	7	12	18	0.5	1.5	112.5	16.07	2	17	2	0	0	1	4	3	4	5	1	1	7	3	24	32	560	80.00	15
7	7	30	60	0.45	2	300	25.00	2	60	1	11.7	21	4	5	3	2	4	4	1	12	1	20	20	8984	748.67	45
2	2	3	6	0.15	2	112.5	14.06	2	120	2	0	0	1	4	2	4	4	1	1	8	6	50	10	600	75.00	4.5
2	2	30	60	0.075	2	75	15.00	1	30	2	0	0	1	4	2	2	2	4	1	5	1	4	4	390	78.00	45
2	2	1.5	3	0.1	2.7	112.5	22.50	1	150	2	0	0	4	2	3	2	4	4	1	5	2	7	7.5	3376	675.20	2.25
2	2	30	30	0.05	0.4	250	35.71	2	60	2	0	0	1	3	2	5	4	5	2	7	1	3	0	180	25.71	30
2	2	6	18	0.2	0.2	75	10.71	2	60	2	0	0	4	4	1	5	5	4	1	7	1	10	120	6000	857.14	12
2	2	4.5	6	0.3	0.15	75	9.38	1	120	2	0	0	3	4	2	4	2	4	1	8	1	0	3	325	40.63	5.25
7	2	3	6	0.03	2.5	225	14.06	2	180	2	0	0	4	2	2	5	4	4	1	16	1	0	30	260	16.25	4.5
Mean		**15.76**	**22.78**	**0.414**	**1.25**	**175.23**	**22.08**	**1.59**	**74.70**											**7.93**	**2.33**	**12.18**	**23.06**	**2511.15**	**367.27**	**19.27**
Standard Deviation		**15.06**	**17.16**	**0.457**	**1.11**	**104.82**	**8.01**	**0.50**	**64.74**											**3.69**	**1.92**	**13.19**	**27.23**	**2859.16**	**442.28**	**15.31**
Standard Error of the mean		**2.90**	**3.30**	**0.088**	**0.213**	**20.17**	**1.54**	**0.10**	**12.46**											**0.710**	**0.370**	**2.54**	**5.24**	**550.25**	**85.12**	**2.95**
Minimum		**0.00**	**3.00**	**0.02**	**0.02**	**56.25**	**9.38**	**1.00**	**15.00**	**1.00**	**0.00**	**0.00**	**1.00**	**2.00**	**1.00**	**2.00**	**2.00**	**1.00**	**1.00**	**4.00**	**1.00**	**0.00**	**0.00**	**20.00**	**2.86**	**2.25**
Maximum		**60.00**	**60.00**	**2.40**	**4.80**	**450.00**	**37.50**	**2.00**	**240.00**	**2.00**	**11.70**	**21.00**	**4.00**	**5.00**	**4.00**	**6.00**	**5.00**	**5.00**	**2.00**	**17.00**	**8.00**	**50.00**	**120.00**	**8984.00**	**1376.67**	**60.00**

Average household expenditure on water /month in rainy season (GH¢) 15.76
Average household expenditure on water /month in dry season (GH¢) 22.8
Average household expenditure on electricity/month (GH¢) 12.18
Average household expenditure on telephones (GH¢) 23.06

Average per capita consumption (l/p/d) = 22.08
Average annual household income (GH¢) = 2759.29
Average annual per capita income = 397.76
Average time to collect water home (min) = 74.7
Average distance from house to main source of water (m) = 413.89
Average distance from house to alterntv source of water (m) = 1245.19
Average household size = 7.93
Average number of households/house = 2.3

Percentage of household who think their current water consumption is enough = 40.74
Percentage of households willing to pay more for water if there was improvement = 88.89

		Rainy season	Dry season		
Percentage of households depending on house pipe as main source of water	=	0.00	0.00	0.00	
Percentage of households depending on public stand pipe as main source of water	=	44.44	51.85	48.15	
Percentage of households depending on neighbours's house pipe as a main source	=	0	0	0.00	48.15
Percentage of households depending on vendors as a main source of supply	=	0	7.41		
Percentage of households depending on well as the main source of water supply	=	7.41	0.00		
Percentage of households depending on stream/river as the main water supply	=	0.00	0.00		
Percentage of households depending on borehole as the main source of supply	=	48.15	40.74		
Percentage of households depending on pond/dam as the main source of supply	=	0	0		
Percentage of households depending on rainfall as the main sources of supply	=	0.00	0.00		

Consumer satisfaction

Percentage of Respondents (%)	Very satisfied	Satisfied	Neither satisfied nor dissatisfied	Dissatisfied	Very dissatisfied	Don't know
	1	2	3	4	5	6
Water quality	59.26	22.22	3.70	14.81	0	0
Hours of flow of water per day	0.00	44.44	7.41	44.44	4	0
Water pressure at taps	3.70	48.15	22.22	25.93	0	0
Complaints handling by service providers	0	37.04	0.00	29.63	11.11	22.22
Queues at water points	7.41	22.22	0.00	51.85	18.52	0

SALAGA

Sources of water		Expenditure on water /month			Distances to sources (Km)		Water consumption			Time spent looking for water	Large storage facilities			Satisfaction						WTP more	Household characteristics		Expenditure on other utilities		Household income/annum	
Rainy season	Dry season	Rainy season	Dry season	Average	Main	Alternative	Quantity(lit)/day	lit/person/day	Is it enough?	Time (minutes)	Yes or No	Size (m^3)	Time to empty it(days)	Water quality	Hours of flow	Water pressure	Complaints handling	Queues	Water tariff		Size	No./house	Electricity/mth	Telephone/mth	Income	Per capita income
5	3	0	2	1	0.1	1.5	120	7.50	2	60	2	0	0	2	4	2	5	5	1	1	16	1	12	8.4	12500	781.25
1	1	5	8	6.5	0	1	130	8.13	2	60	2	0	0	5	1	2	2	5	1	1	16	1	30	10	10800	675.00
5	1	0	4	2	0.005	2.5	100	12.50	1	40	2	0	0	4	1	2	4	1	1	1	8	1	8	30	7100	887.50
1	3	4	60	32	0.15	1	150	11.54	2	60	2	0	0	2	4	2	4	5	1	1	13	1	0	8.4	8260	635.38
1	1	4	4	4	0	2.5	60	8.57	2	20	2	0	0	3	2	2	4	2	1	1	7	3	10	0	7346	1049.43
3	3	45	60	52.5	0.08	2	120	20.00	2	40	2	0	0	4	1	3	2	5	1	1	6	4	35	60	10200	1700.00
1	1	4	4	4	0	2	100	12.50	2	10	2	0	0	5	4	3	4	1	1	1	8	5	20	12	7300	912.50
1	1	4	4	4	0	0.15	112.5	18.75	2	5	2	0	0	1	3	4	5	3	2	1	6	4	2.5	20	360	60.00
1	4	4	52.5	28.25	0.1	2	112.5	37.50	2	120	2	0	0	2	4	5	5	3	2	2	3	2	3	4	232	77.33
3	3	4	4	4	0.1	0.4	225	28.13	2	60	2	0	0	3	4	5	5	3	2	1	8	2	15	20	2345	293.13
1	1	5.6	4	4.8	0	2.5	112.5	28.13	2	45	2	0	0	4	3	3	5	3	2	2	4	4	7.5	8	52	13.00
1	4	4	6	5	0.05	2	112.5	22.50	2	20	2	0	0	2	3	3	4	6	3	1	5	3	7	4	1128	225.60
1	4	4	14	9	0.15	1.5	112.5	37.50	2	30	1	2.25	14	4	4	4	3	1	1	1	3	2	6	10	4770	1590.00
3	3	0.2	0.4	0.3	0.05	2	112.5	22.50	2	120	2	0	0	2	1	4	6	5	2	1	5	4	5	8	1350	270.00
1	1	16	8	12	0	2.7	450	75.00	2	30	2	0	0	5	4	2	4	4	5	1	6	5	15	10	380	63.33
3	3	4	4	4	0.02	2	225	20.45	2	35	2	0	0	5	2	2	4	1	4	1	11	3	20	20	2363	214.82
3	3	8	8	8	0.05	2	450	28.13	2	30	2	0	0	4	5	2	6	5	1	1	16	1	30	20	1009.5	63.09
1	1	8	8	8	0.05	3	225	32.14	2	60	2	0	0	2	4	2	3	1	5	1	7	6	8	25	740	105.71
1	1	16	16	16	0	0	225	28.13	1	10	2	0	0	4	2	2	5	5	5	1	8	4	12	20	1240	155.00
5	5	0	0	0	0	0.5	225	20.45	1	5	2	0	0	3	4	4	3	3	3	1	11	7	28	5.6	735	66.82
1	1	4	4	4	0	1.6	112.5	16.07	1	0	2	0	0	2	2	3	2	1	2	2	7	1	10	4	545	77.86
1	1	4	4	4	0	1	112.5	18.75	2	180	2	0	0	2	3	4	5	4	3	1	6	8	15	40	7600	1266.67
5	1	0	4	2	0	0	112.5	4.33	2	47.5	2	0	0	3	4	3	4	3	2	1	26	1	30	98	3800	146.15
1	1	4	4	4	0	2.8	450	28.13	1	0	2	0	0	2	2	4	4	1	2	1	16	1	40	8	1540	96.25
5	3	0	12	6	0.02	3	225	25.00	1	10	2	0	0	4	4	4	3	5	2	1	9	4	4	6	595	66.11
5	3	0	1.6	0.8	0.004	3	300	42.86	2	30	2	0	0	3	5	3	5	2	4	1	7	1	8	20	638	91.14
5	3	0	5	2.5	0	3	225	18.75	1	30	2	0	0	1	5	4	5	5	4	1	12	1	0	40	1355	112.92
1	1	4	5.5	4.75	0	1.5	72	12.00	1	35	2	0	0	2	2	4	4	4	2	1	6	4	5.4	10	1617.12	269.52
5	1	0	4	2	0	3	450	50.00	1	60	2	0	0	3	4	3	4	2	3	1	9	1	6	5	1025	113.89
1	1	4	4	4	0	2	400	33.33	1	2.5	2	0	0	2	4	2	4	1	4	1	12	1	20	80	4461	371.75
5	1	0	4	2	0	2.5	450	26.47	1	0	2	0	0	2	2	2	3	2	2	1	17	4	30	5	4365	256.76
Mean		**5.15**	**10.42**	**7.79**	**0.030**	**1.83**	**206.11**	**24.38**		**40.48**											**9.48**	**2.90**	**14.27**	**19.98**	**3475.86**	**409.93**
Standard Deviation		**8.41**	**16.09**	**10.99**	**0.046**	**0.937**	**130.49**	**14.31**		**39.82**											**5.09**	**1.97**	**11.13**	**22.65**	**3602.23**	**471.51**
Standard Error of the mean		**1.51**	**2.89**	**1.97**	**0.008**	**0.168**	**23.44**	**2.57**		**7.15**											**0.914**	**0.354**	**2.00**	**4.07**	**646.98**	**84.69**
Minimum		**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**60.00**	**4.33**	**1.00**	**0.00**	**1.00**	**0.00**	**0.00**	**1.00**	**1.00**	**2.00**	**2.00**	**1.00**	**1.00**	**1.00**	**3.00**	**1.00**	**0.00**	**0.00**	**52.00**	**13.00**
Maximum		**45.00**	**60.00**	**52.50**	**0.15**	**3.00**	**450.00**	**75.00**	**2.00**	**180.00**	**2.00**	**2.25**	**14.00**	**5.00**	**5.00**	**5.00**	**6.00**	**6.00**	**5.00**	**2.00**	**26.00**	**8.00**	**40.00**	**98.00**	**12500.00**	**1700.00**

Average household expenditure on water /month in rainy season (GH¢) = 5.15
Average household expenditure on water /month in dry season (GH¢) = 10.42
Average household expenditure on electricity/month (GH¢) = 14.27
Average household expenditure on mobile phones (GH¢) = 19.98

Average per capita consumption (l/p/d) = 24.38
Average annual household income (GH¢) = 3475.86
Average annual per capita income = 409.93
Average time to collect water home (min) = 40.48
Average distance from house to main source of water (m) = 29.97
Average distance from house to alterntv source of water (m) = 1827.42
Average household size = 9.48
Average number of households/house = 2.90

Percentage of household who think their current water consumption is enough = 35.48
Percentage of households willing to pay more for water if there was improvement = 90.32

		Rainy season	Dry season			
Percentage of households depending on house pipe as main source of water	=	54.84	54.84	54.84		
Percentage of households depending on public stand pipe as main source of water	=	0.00	0.00	0.00		
Percentage of households depending on neighbours's house pipe as a main source	=	16.13	32.26	24.19	79.03	
Percentage of households depending on vendors as a main source of supply	=	0	9.68			
Percentage of households depending on well as the main source of water supply	=	29.03	3.23			
Percentage of households depending on stream/river as the main water supply	=	0.00	0.00			
Percentage of households depending on borehole as the main source of supply	=	0	0			
Percentage of households depending on pond/dam as the main source of supply	=	0	0			
Percentage of households depending on rainfall as the main sources of supply	=	0.00	0			

Consumer satisfaction

Percentage of Respondents (%)	Very satisfied	Satisfied	Neither satisfied nor dissatisfied	Dissatisfied	Very dissatisfied	Don't know
	1	**2**	**3**	**4**	**5**	**6**
Water quality	6.45	38.71	19.35	22.58	12.90	0
Hours of flow of water per day	12.90	22.58	12.90	41.94	9.68	0
Water pressure at taps	0.00	38.71	25.81	29.03	6.45	0
Complaints handling by service providers	0	9.68	16.13	38.71	29.03	6.45
Queues at water points	25.81	12.90	19.35	9.68	29.03	3.23
Water tariff	29.03	35.48	12.90	12.90	9.68	0

SOGAKOPE

Sources of water		Expenditure on water /month			Distances to sources (Km)		Water consumption			Time spent looking for water	Large storage facilities			Satisfaction						WTP more	Household characteristics		Expenditure on other utilities		Household income/annum	
Rainy season	Dry season	Rainy season	Dry season	Average	Main	Alternative	Quantity(lit)/day	lit/person/day	Is it enough?	Time (minutes)	Yes or No	Size (m^3)	Time to empty it(days)	Water quality	Hours of flow	Water pressure	Complaints handling	Queues	Water tariff		Size	No./house	Electricity/mth	Telephone/mth	Income	Per capita income
2	2	9.5	9.5	9.5	0.05	0.1	90	22.50	1	20	2	0	0	1	2	2	3	4	2	1	4	3	10	30	840	210.00
2	2	6.8	6.8	6.8	0.03	0.06	72	24.00	1	20	2	0	0	1	3	4	6	4	3	1	3	13	8	8	500	166.67
2	2	15	15	15	0.2	1.7	270	24.55	2	30	2	0	0	2	4	2	3	5	5	1	11	3	21	150	3500	318.18
1	1	40.5	40.5	40.5	0	1.95	90	22.50	1	2	2	0	0	3	2	2	5	1	5	1	4	4	10	0	1620	405.00
2	2	3	3	3	0.12	1.66	36	36.00	1	5	2	0	0	2	2	2	6	3	3	1	1	2	3	30	1000	1000.00
2	2	1.5	1.5	1.5	0.15	0	90	22.50	1	20	2	0	0	1	2	2	2	4	3	2	4	3	23	30	600	150.00
1	1	40	40	40	0	2	144	48.00	2	0	2	0	0	2	2	2	5	1	4	2	3	1	26	24	5400	1800.00
1	1	4.4	4.4	4.4	0	2	90	18.00	1	0	2	0	0	2	1	2	4	1	4	2	5	1	12	24	4320	864.00
1	1	8	8	8	0	0.3	90	15.00	1	15	2	0	0	1	2	2	3	1	5	2	6	1	21	20	5800	966.67
2	2	4	4	4	0.5	2.3	30	6.00	2	20	2	0	0	2	3	3	6	5	4	1	5	3	5	4	1800	360.00
1	1	10	10	10	0	0.3	80	13.33	1	0	2	0	0	2	2	2	4	1	4	2	6	4	7	8	2500	416.67
1	1	22	22	22	0	2.1	200	28.57	1	0	1	1	14	2	2	2	4	1	2	1	7	1	20	20	39200	5600.00
2	2	12	12	12	0.2	2	90	15.00	1	10	2	0	0	2	2	2	2	5	3	1	6	4	10	12	1000	166.67
1	1	60	60	60	0	2.5	450	45.00	1	10	2	0	0	2	2	2	2	1	2	2	10	1	40	20	2150	215.00
2	2	3	3	3	0.5	0.2	90	9.00	1	4	2	0	0	4	1	2	6	2	2	1	10	7	14	20	2400	240.00
1	1	5.6	5.6	5.6	0	1	108	54.00	1	0	2	0	0	1	1	2	2	1	3	1	2	14	16	40	3600	1800.00
2	2	12	12	12	0.3	2	72	24.00	2	15	2	0	0	1	3	2	6	5	3	2	3	9	9	16	600	200.00
1	1	7.2	7.2	7.2	0	0.5	180	25.71	1	0	2	0	0	2	2	2	4	1	5	2	7	1	6	30	10320	1474.29
1	1	4	7	5.5	0	0.6	90	18.00	1	0	2	0	0	1	2	1	2	1	3	2	5	1	2	25.2	18700	3740.00
1	1	8.32	8.32	8.32	0	1	180	30.00	1	0	2	0	0	2	3	3	5	1	4	2	6	1	10	20	8940	1490.00
1	1	9	9	9	0	2.3	90	30.00	1	0	2	0	0	2	2	2	5	1	4	1	3	4	3.5	24	2450	816.67
1	1	20	20	20	0	1.9	220	22.00	1	0	1	2.25	14	2	2	2	5	1	2	1	10	1	65	92	31365	3136.50
Mean		**13.90**	**14.04**	**13.97**	**0.093**	**1.29**	**129.64**	**25.17**		**7.77**											**5.5**	**3.7**	**15.52**	**29.42**	**6754.77**	**1160.74**
Standard Deviation		**14.79**	**14.70**	**14.40**	**0.157**	**0.881**	**93.39**	**11.74**		**9.43**											**2.8**	**3.8**	**14.29**	**32.39**	**10215.71**	**1358.48**
Standard Error of the mean		**3.15**	**3.14**	**3.07**	**0.034**	**0.188**	**19.91**	**2.50**		**2.01**											**0.6**	**0.8**	**3.05**	**6.91**	**2178.00**	**289.63**
Minimum		**1.50**	**1.50**	**1.50**	**0.00**	**0.00**	**30.00**	**6.00**	**1.00**	**0.00**	**1.00**	**0.00**	**0.00**	**1.00**	**1.00**	**1.00**	**2.00**	**1.00**	**2.00**	**1.00**	**1.00**	**1.00**	**2.00**	**0.00**	**500.00**	**150.00**
Maximum		**60**	**60**	**60**	**0.5**	**2.5**	**450**	**54**	**2**	**30**	**2**	**2.25**	**14**	**4**	**4**	**4**	**6**	**5**	**5**	**2**	**11**	**14**	**65**	**150**	**39200**	**5600**

Average household expenditure on water /month in rainy season (GH¢)	13.90
Average household expenditure on water /month in dry season (GH¢)	14.04
Average household expenditure on electricity/month (GH¢)	15.52
Average household expenditure on mobile phones (GH¢)	29.42

Average per capita consumption (l/p/d)	=	25.17
Average annual household income (GH¢)	=	6754.77
Average annual per capita income	=	1160.74
Average time to collect water home (min)	=	7.8
Average distance from house to main source of water (m)	=	93.18
Average distance from house to alterntv source of water (m)	=	1294.09
Average household size	=	5.5
Average number of households/house	=	3.7

Percentage of household who think their current water consumption is enough	=		81.8	
Percentage of households willing to pay more for water if there was improvement	=		54.5	
		Rainy season	Dry season	
Percentage of households depending on house pipe as main source of water	=	59.09	59.09	
Percentage of households depending on public stand pipe as main source of water	=	40.91	40.91	100
Percentage of households depending on neighbours's house pipe as a main source	=	0	0	
Percentage of households depending on vendors as a main source of supply	=	0	0	
Percentage of households depending on well as the main source of water supply	=	0.00	0.00	
Percentage of households depending on stream/river as the main water supply	=	0.00	0.00	
Percentage of households depending on borehole as the main source of supply	=	0	0	
Percentage of households depending on pond/dam as the main source of supply	=	0	0	
Percentage of households depending on rainfall as the main sources of supply	=	0.00	0	

Consumer satisfaction

Percentage of Respondents (%)	Very satisfied	Satisfied	Neither satisfied nor dissatisfied	Dissatisfied	Very dissatisfied	Don't know
	1	**2**	**3**	**4**	**5**	**6**
Water quality	31.82	59.09	4.55	4.55	0	0
Hours of flow of water per day	13.64	63.64	18.18	4.55	0	0
Water pressure at taps	4.55	81.82	9.09	4.55	0	0
Complaints handling by service providers	0	22.73	13.64	18.18	22.73	22.73
Queues at water points	59.09	4.55	4.55	13.64	18.18	0
Water tariff	0	22.73	31.82	27.27	18.18	0

Appendix VII

Year	1990	1991	1992	1993	1994	1995	1996	1997	1998
Population (millions)	14.306	14.672	15.046	15.431	15.825	16.23	16.644	17.07	17.506
Annual average inflation (%)	37.259	18.031	10.056	24.96	24.87	59.462	44.357	24.838	19.215
GDP/Capita (PPP)	663.509	705.269	746.94	781.819	804.077	832.272	864.926	893.41	922.132
Implied PPP conversion rate (cedis/$)	227.337	260.48	262.777	320.957	409.029	573.879	787.616	925.449	1071.44
GDP (PPP) share of world total (%)	0.037	0.039	0.04	0.042	0.042	0.042	0.042	0.043	0.044
Average $/GH¢ exchange rate (Old cedis)							1626.568	2045.524	2312.703
Average CD$/GH¢ exchange rate (Old cedis)							1189.828	1469.884	1555.063
Average €/GH¢ exchange rate (Old cedis)									

Year	1999	2000	2001	2002	2003	2004	2005	2006	2007	
Population (millions)	17.953	18.412	18.883	19.366	19.861	20.368	20.889	21.423	21.97	Sourced from IMF, World Economic Outlook Database April 2008
Annual average inflation (%)	12.446	25.151	32.906	14.815	26.677	12.629	15.113	10.913	9.6	Sourced from IMF, World Economic Outlook Database April 2008
GDP/Capita (PPP)	952.556	984.509	1024.13	1062.26	1113.31	1176.44	1251.44	1338.94	1426.08	Sourced from IMF, World Economic Outlook Database April 2008
Implied PPP conversion rate (cedis/$)	1203.39	1497.9	1968.65	2375.28	2992.08	3333.94	3720.6	4066.87	4465.08	Sourced from IMF, World Economic Outlook Database April 2008
GDP (PPP) share of world total (%)	0.044	0.044	0.044	0.045	0.046	0.046	0.047	0.048	0.048	Sourced from IMF, World Economic Outlook Database April 2008
Average $/GH¢ exchange rate (Old cedis)	2789.698	5397.999	7081.870	7861.137	8645.634	8954.0825	9054.4775	9,137.124	9359.864	Sourced from Bank of Ghana at http://www.bog.gov.gh/index1.php?linkid=139&qrydate
Average CD$/GH¢ exchange rate (Old cedis)	1875.893	3493.751	4615.028	5014.713	6133.156	7017.8683	7510.0833	7,981.155	8848.820	Sourced from Bank of Ghana at http://www.bog.gov.gh/index1.php?linkid=139&qrydate
Average €/GH¢ exchange rate (Old cedis)		5222.279	6565.877	7945.912	9901.529	11161.156	11221.556	11959.913	12936.888	Sourced from Bank of Ghana at http://www.bog.gov.gh/index1.php?linkid=139&qrydate but coloured data sourced from www.oanda.com/convert/classic as indicated on the comment box

Ghana had a redenomination on the 1st of July 2007
¢10000(old cedis) = GH¢1 (new cedis) and for the purpose of this research new Ghana cedis is used

Inflational effects on projects cost

Asiakwa

Year	2003	2004	2005	2006	2007	
effect (%)	1	1.12629	1.27742	1.38655	1.48238	

Atebubu

Year	2002	2003	2004	2005	2006	2007
effect (%)	1	1.26677	1.39306	1.54419	1.65332	1.74915

Bekwai

Year	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
effect (%)	1	1.12446	1.37597	1.70503	1.85318	2.11995	2.24624	2.39737	2.5065	2.60233

Bole

Year	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
effect (%)	1	1.24838	1.44053	1.56499	1.8165	2.14556	2.29371	2.56048	2.68677	2.8379	2.94703	3.04286

Damongo

Year	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
effect (%)	1	1.19215	1.31661	1.56812	1.89718	2.04533	2.3121	2.43839	2.58952	2.69865	2.79448

Salaga

Year	2000	2001	2002	2003	2004	2005	2006	2007
effect (%)	1	1.32906	1.47721	1.74398	1.87027	2.0214	2.13053	2.22636

Apam

Year	2004	2005	2006	2007
effect (%)	1	1.15113	1.26026	1.35609

Sogakope

Year	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
effect (%)	1	1.12446	1.37597	1.70503	1.85318	2.11995	2.24624	2.39737	2.5065	2.60233